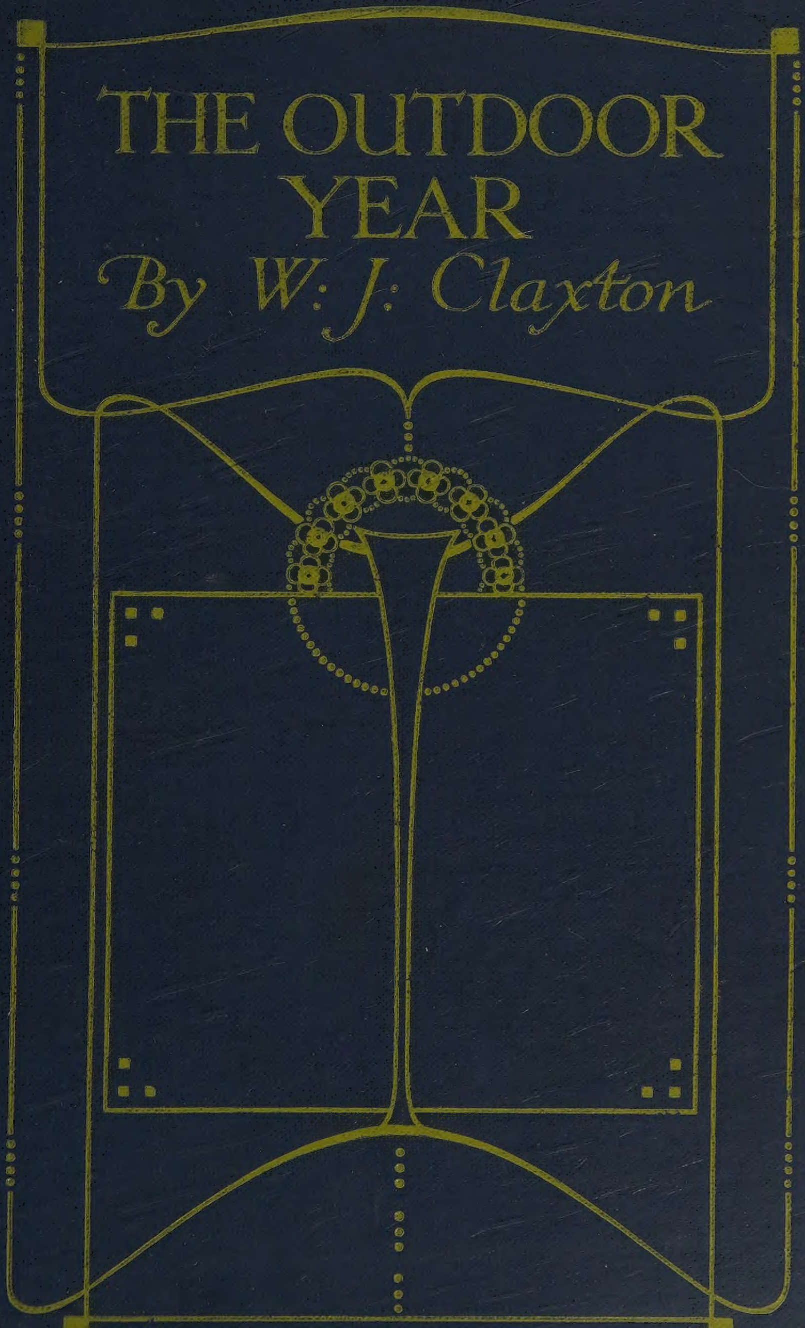

# THE OUTDOOR YEAR

By W. J. Claxton

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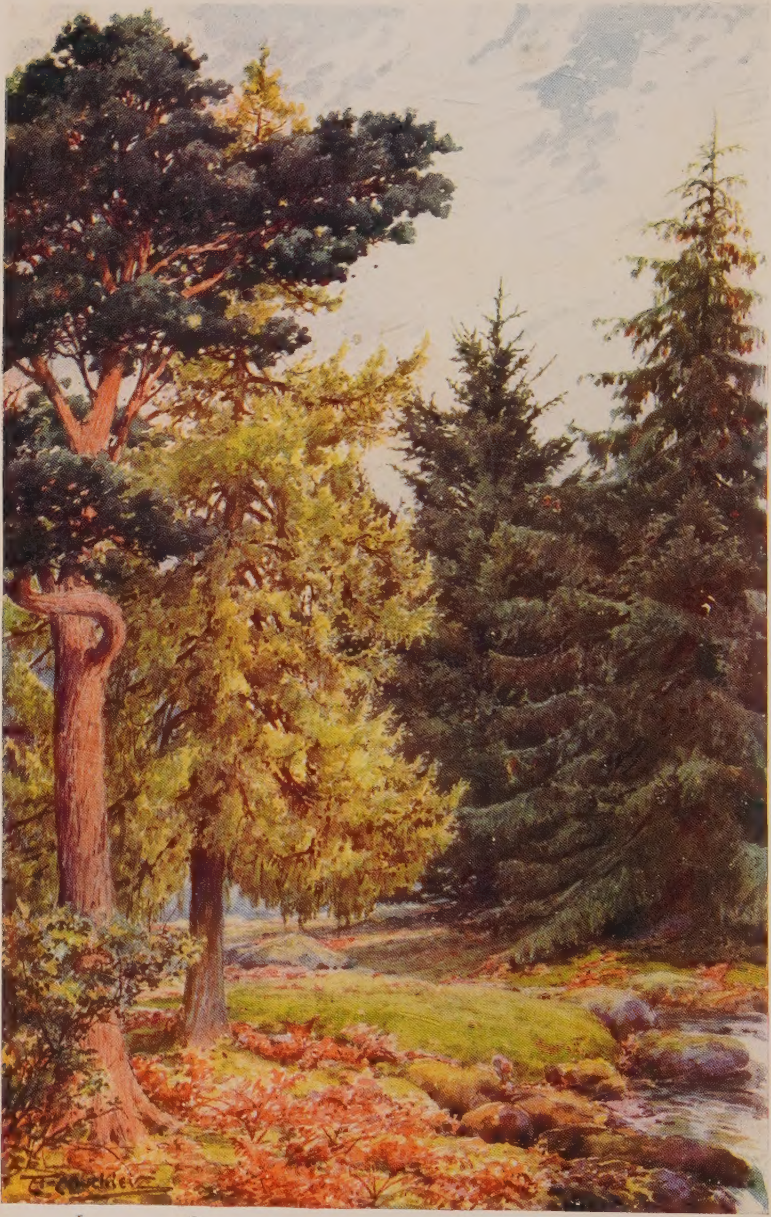

CONIFERS

1, Scotch Pine. 2, Larch. 3, Spruce. 4, Douglas Fir.

# THE
# OUTDOOR YEAR

BY

WILLIAM J. CLAXTON

*Author of "Angling and Rambling" "Insect Workers" &c.*

BLACKIE AND SON LIMITED
50 OLD BAILEY LONDON
GLASGOW AND BOMBAY
1922

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> Season of mists and mellow fruitfulness!
> Close bosom friend of the maturing sun;
> Conspiring with him how to load and bless
> With fruit the vines that round the thatch eaves run;
> To bend with apples the moss'd cottage trees,
> And fill all fruit with ripeness to the core;
> To swell the gourd, and plump the hazel shells
> With a sweet kernel; to set budding more,
> And still more, later flowers for the bees,
> Until they think wárm days will never cease,
> For summer has o'erbrimmed their clammy cells.
> —*J. Keats.*

What better description of the "golden month" is possible than the beautiful imagery of this poem? As one walks through the woodlands one sees the flecking of russet, the beeches having the appearance of loaded fruit, and the edging of brownish-yellow on the stately chestnuts. The trees, indeed, proclaim themselves most in this month. In Summer, they are a mass of foliage; in Winter, even in their nakedness, their characteristic shapes of trunk and branches inform the observer to what variety they belong. But in September they have shape and colouring too. There is the gnarled and knotted oak, festooned with acorns, and bronzed and weather-beaten; the yellow elm; the black ash; and copper beech! Truly a most harmonious wealth of colour is visible in the September woods!

From many trees, especially those of northern districts, the leaves are already beginning to fall. Underneath are soft and downy beds formed by their leaves. Beds for frogs and beds for gnomes; homes and hiding-places for weasel, stoat, and rabbit. The leaves as they fall seem to caress one another when they have reluctantly left their parent tree. Shakespeare beautifully pictures this season in one of his immortal sonnets, an extract of which runs:

> That time of year thou may'st in me behold
> When yellow leaves, or none, or few, do hang
> Upon those boughs which shake against the cold,
> Bare, ruined choirs, where late the sweet birds sang.
> —*Shakespeare* (*Sonnet* **73**).

To study nature in its most fascinating mood, one should traverse the pathless woods in September. But unfortunately this wise dictum must represent to many a counsel of perfection. It is quite useless to advise dwellers in our congested cities to take a nature-study walk in the woods. Even in rural districts, where "woods do most abound", the gamekeeper is a most arbitrary person at times. But, if one be quite prohibited from taking a ramble, the next best thing is to read descriptions by those who have done so, for in these word-pictures one may often pick up a hint, or "learn a wrinkle".

It behoves all of us, if we wish to be successful students, to cultivate our faculties of observation to the highest degree. Unfortunately this is not always done. Most of us have two eyes, it is certain; but it is a question if we do not think one of them superfluous. Nothing short of an elephant or a lightning flash will attract some people's attention, and their ears are insensible to sounds less overpowering than a clarion call. If they walk through the streets they see "nothing particular", and when taking a country ramble they seldom see anything but the most common forms of animal life. The flowers are all buttercups, the plants all grass, the birds all sparrows, the clouds all black.

Nature presents a closed book to the man, woman, or child whose faculties are thus dormant. On the other hand, the persevering and sympathetic study of her ways is an unrivalled means of developing the faculty of observation.

## In the Woods

To study the wood in the proper manner one should wander along the outside of it. There the animals most do congregate. This is probably due to the fact that they can get more light and air on the outskirts. Rabbits make their burrows on the banks skirting cornfields, and there, also, we should find the rabbit's natural enemy—the weasel. If one wander along the ridings inside the wood, one can see most by standing quite still. I have frequently tried this plan, and at times some of the denizens of the woods have run to within a few yards of me. Perchance one would be fortunate enough to see a mole burrowing his tunnel in the leafy mould, a fox gallop by in the narrow riding, or a stoat almost cross one's feet.

Taking the animals found in the woods with regard to size, we must commence with the Fox.

The **Fox** is probably the most intelligent of all quadrupeds. It is closely allied to the dog, the chief points of difference being in the sharper muzzle and shorter legs in proportion to size of body. Its "brush" is also longer, and its ears much more erect. The fox has cat-like eyes, i.e. they contract in strong light and expand in darkness. This enables the animal to hunt at night. It excavates its own lair by burrowing much like a rabbit, but it is a thief in this respect, as it frequently steals burrows from other animals and converts them into its own "earth". The natural slyness of the animal is shown by the number of exits to its lair. I have counted as many as ten bolt-holes from a fox's "earth". The power of scent is very acute, and its faculties of hearing are highly developed. It has a peculiar, strong scent, which leaves the "trail" that gives opportunity for the sport of fox-hunting. When "cornered" by the hounds the animal is ready for any emergency. It has been known to climb roofs of houses and hide in the chimney. It frequently escapes by taking refuge in a drain-pipe. For this reason one may often see a grating placed over the mouth of the drain, so that the animal is prevented from going in when the "chase is keen".

The **Badger**, often called the **Brock**, is now rather rare, but it may still be found on the southern slopes of isolated, wooded hills. It is a very solitary animal, and extremely retiring in its habits. In shape it has a long head, terminating with a "pig's snout", a thick-set body, very small ears for its size, narrow slits for eyes, short and strong legs, with long curved claws similar to those of the mole. Its hue is proverbial—"Grey as a badger". It makes a most comfortable home for itself. Nine or ten passages, each about a dozen yards long, are burrowed towards a central chamber, much as the spokes of a wheel converge towards the hub. The central chamber is lined with feathers, moss, or dry leaves. The strange thing is that the badger only uses one or two of these passages; the others are simply bolt-holes in case of emergency. It feeds by night on vegetables, small quadrupeds, reptiles, frogs, and the grubs of wasps. Its hair is used for shaving brushes and artists' brushes. I have never been fortunate enough to find a badger "at home", although I have seen its lair. It was once my misfortune to see that most degrading so-called "sport" of "badger-baiting". The animal was placed in a barrel, and three dogs were set on it to "worry" it. Bets were made as to which dog would succeed in drawing it out. When the animal was eventually pulled out, it was returned again for further "sport". Bleeding, and probably limbless, it offered a most stubborn resistance for a considerable time.

**The Weasel Group.**—This embraces the **Polecat**, the **Stoat** or **Ermine**, and, of course, the **Weasel**.

The **Polecat**, or **Fitchet**, or **Foumart**, was formerly common in the woodlands, but of late years it has been practically exterminated. It is a dusky-brown creature, about 18 inches in length. Farmers look upon this animal as a great pest, for it robs the farmyards of poultry, even of such large birds as geese and turkeys. It is extremely useful, though, in other ways, for it kills large numbers of rats and mice. This, too, is a nocturnal animal. It has glands which secrete a most fetid substance when it is alarmed. The polecat burrows its home under the roots of a tree, or lives in a deserted rabbit burrow. Its hair is used for making a superior kind of artists' brush. The ferret is a half-tamed white variety used for catching rats and rabbits.

The **Stoat,** or **Ermine,** has much the same characteristics as the Polecat, but is smaller. In colder regions its fur, during winter, is almost pure white, with a black tip to the tail, and is in great request for the robes of state dignitaries. In more temperate regions it retains the reddish-brown fur throughout the year. The animal is a very fierce hunter of game. It tracks down rabbits and even hares. Gamekeepers are rapidly exterminating all the weasel family. A gamekeeper once showed me a stoat's nest. Inside were two chickens, one pheasant, two rabbits, and one "leveret" or young hare. The peculiar thing was that the victims were not mangled in any way. The stoat had killed them by simply puncturing a vital artery in their necks.

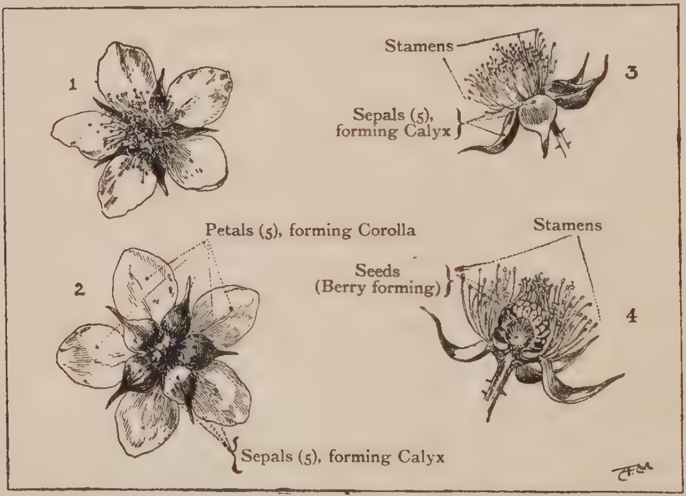
The **Weasel** is rather smaller than its relations, only attaining a length of seven or eight inches. It is a very good climber and can easily scale trees and walls. To see one at work you should follow the advice given at the head of this chapter,

Weasel

that is, stand quite still. I have frequently seen one when angling beside a plantation. The creature is endowed with great courage and will attack animals far stronger than itself. A number of them have even been known to attack a human being. It robs the farmyards unmercifully. Like the other members of the family, it exudes a musky odour.

## Plant Life.—(A) Seed Formation

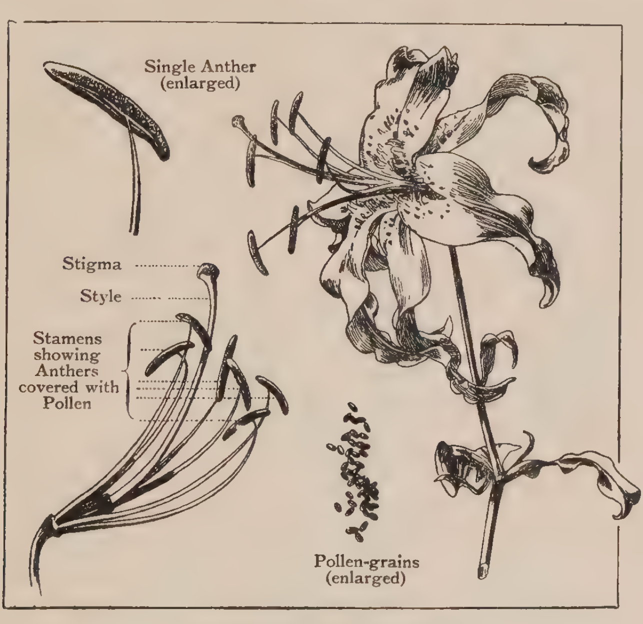
September has rightly been called the "seed-scattering" month. All the efforts of plant life are now devoted to propagating future plants, and the various methods of doing this afford a most interesting study.


1
Stamens
3
Sepals (5), forming Calyx
Petals (5), forming Corolla
Stamens
2
Seeds (Berry forming)
4
Sepals (5), forming Calyx
C.F.M.

1, Bramble Flower. 2, Flower, from behind. 3, Flower, with petals removed. 4, Flower cut through, showing berry forming

A brief description of Seed Formation seems appropriate at this point. Many berries, fruits, &c., are at this season available for dissection.

Most flowers possess well-defined *whorls* or *circles* arranged round a common centre. The outer circle is called the *calyx* or *cup*. Next comes the *corolla*, which is divided into the *petals* of the flower. Inside the corolla are the *stamens*. These resemble thin threads, and there is a little knob on the top of each. The knobs are known as *anthers*, and they contain the *pollen*. The central part of the flower, underlying the stamens, is known as the *pistil*, each of its parts, when it is compound, being called a *carpel*. When complete, a carpel has three divisions, viz. the *ovary* or "*seed-box*", the *stalk* or *style*, and the *head* or *stigma*.



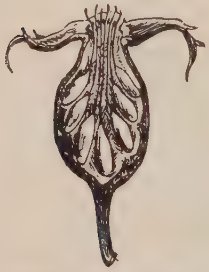
Lily, showing Parts of Flower

This is a very general description, and only applies to the perfect flower. In some cases the anthers are missing; in others, the calyx, and so on.

In seed formation, the *carpels* and *stamens* are indispensable. These are the "life" of the flower, and the other parts, though more noticeable, are, in comparison, of very little use. Seeds are formed in the pistil, but without the help of the stamens they would be quite barren. When the knobs on the stamens are ripe they burst, and the pollen-grains are liberated. Many of them fall on the stigmas or ovary, and fertilize them. They stay there owing to the fact that the stigma has produced a gluey substance. Then they grow and eject a fine tube. This, in turn, injects itself into the seed. A great change now takes place in the seed, and it becomes capable of bringing forth a plant after its own kind when it is propagated under suitable conditions.

The **corolla** now shows its chief use. It guards the young flower by forming a shield around it.

In some cases the wind blows the pollen on to neighbouring flowers after the stamens have burst. This is known as *cross-fertilization*, and is very common.



**Vertical Section of Hip of Rose**

The stamens are called the *male* organs and the carpels the *female* organs of the flower. Frequently we see flowers without stamens. These are known as *female flowers*. Others may have no pistil, and would be classed as *male flowers*.

Since fruits are very prominent in September it would be well to give a brief description of these.

Fruit is really the *ripened pistil.* The petals have been shed; the flowers have lost their gaudy hue and have been blown by the wind in all directions. But now the "seed-box" is fast reaching maturity as the seeds within are gradually developing. If we closely observe a seed-box we shall see that there are well-defined divisions. To study fruit formation, a *hip*, i.e. the fruit of the wild briar or dog-rose, would be serviceable. The hip contains numerous little fruits of the kind called *achenes*, each containing a single seed. These achenes are leathery or bony, and often hairy. As the hip matures, the hard outer case splits, and the seeds fall out, enter the ground, and, under suitable conditions, produce their own kind.

Photo. Chas. Reid.

FOX

*Page* 11

C 257

Photo. Chas. Reid.

BADGER

*Page* 12

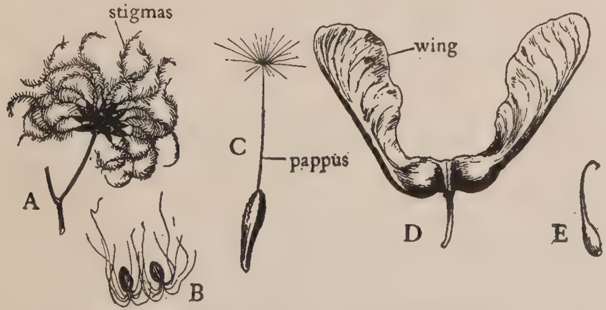
**Fruits** may be roughly classified into:

1. *Capsules.*—These open when ripe and the seeds fall out (specimen—the poppy).
2. *Pods.*—Fruits like peas and beans (specimen—broad bean).
3. *Drupes.*—Stone fruits (specimen—apricot).
4. *Pomes.*—Fleshy fruit such as the apple (specimen—apple).
5. *Nuts.*—Hard and dry seeds contained in a strong case (specimen—hazel-nut). The *achene* is a kind of nut (specimen—buttercup).
6. *Berries.*—Containing seeds embedded in pulpy matter (specimen—blackberry).
7. *Samara.*—Fruits that are light and are capable of being carried to considerable distances by the wind (specimen—maple).

## Plant Life.—(B) Seed Dispersal

Nature adopts many methods for carrying seeds from place to place. Briefly stated they are dispersed by:

1. *Wind.*—Many pistils develop long necks surmounted by feathery sepals. These are extremely light and may be blown for miles. (Specimen, thistle seeds.)



Examples of Seeds borne by Wind, and Animals (E)

A, Achenes of Traveller's Joy. B, Seeds of Willow-herb. C, Fruit of Dandelion. D, Samara of Sycamore. E, Achene of Avens, showing hook.

2. *Animals.*—Many seeds have very small "fingers". These cling to the backs of sheep, dogs, &c., and are carried away. Others possess "burrs", which adhere to the clothes very readily, or to the hair of animals. (Specimens, Burdock and Goose-grass.)

3. *Creepers.*—Some grasses have a peculiar way of dispersing their seeds. The seeds rest on the ground, and are affected by atmospheric changes. Such seeds are surrounded by bristles. These expand or contract with the changes of weather. When expanding they "creep" a short distance.

4. *Explosion.*—Many seed-boxes can be made to "pop" by nipping them. They also do this in a natural state when fully matured. A good example of this "popping" action is the Balsam. When they explode, the fruit is torn into segments, and the seed is carried to some little distance.

5. *Running Water.*—Some water-plants, by a special provision of Nature, have their seeds so designed that they will float on the river for a considerable time. Examples of these are the Water-lilies and Sedges. Cocoanuts are specially adapted for this purpose, as their waterproof rind is surrounded by a buoyant fibre-packing. This probably accounts for the formation of cocoanut palm trees on coral islands.

## Hips and Haws, &c.

**Hips** are the fruit of the wild briar rose. Each hip, as we have seen, contains numerous achenes, shaped somewhat like a grain of "great" wheat. When the hip is fully developed, the hard outer case bursts, and the achenes, each containing a seed, are liberated.

**Haws** are the fruit of the hawthorn, known as "May" blossom in England and "flourish" in Scotland. The berries grow in groups, some groups containing a dozen berries. The haw comprises four parts:

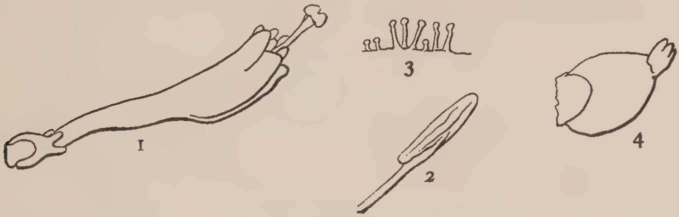
(i) The outer, or coloured part.
(ii) Thin layer of pulpy substance.
(iii) Hard stony case.
(iv) Long spindle-shaped seed.

Haw of Hawthorn

Haws attract large numbers of wild birds. Scores of our northern visitors, such as the fieldfare and redwing, make admirable meals from these berries. They are also in large demand for wine-making in rural districts. "Quick" hedges are produced by sowing them in loamy soil.

Hips are chiefly used for decorative purposes, and also for wine-making.

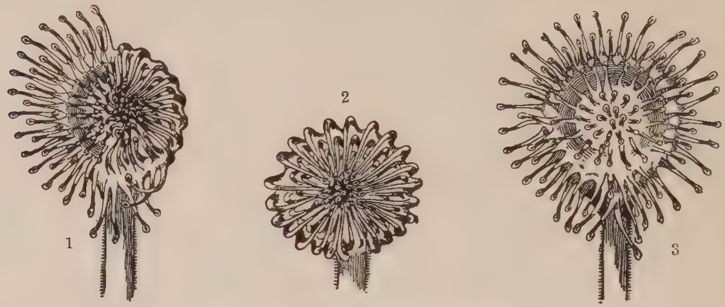
**Honeysuckle.**—This is a good example of the "stem-twining" plant. Its foliage appears quite early in the year, but it is very late before it blooms. It winds its stem very securely round trees, &c., and has been found to kill the branch upon which it clings. Sometimes it buries its stem in the bark of a young tree. It is very common in the hedgerows. The stamens are extremely well defined. The flower is found at the end of each flowering stem. It has a sweet scent.



Honeysuckle

1, Complete flower. 2, Stamen. 3, Part of corolla with gland hairs. 4, Berry.

**Sundew.**—This grows on marshy soil. Its leaves are spoon-shaped and covered with tiny red hairs. These hairs emit a sticky substance. The plant derives its name from this, for when the sun shines on the fluid it is reflected by sparkling lights which glisten like dewdrops. The red hairs are death-traps for the insects, for the sticky fluid adheres to their feet and holds them fast. The hairs then close in upon their prisoners, and they cannot escape. After a day or two the hairs recover their original positions, but the insects have only their skeletons left. For this reason the Sundew is classified among the *carnivorous* plants. Botanists hold that the plant can differentiate between substances which are good for food and those which are not, and they also aver that the



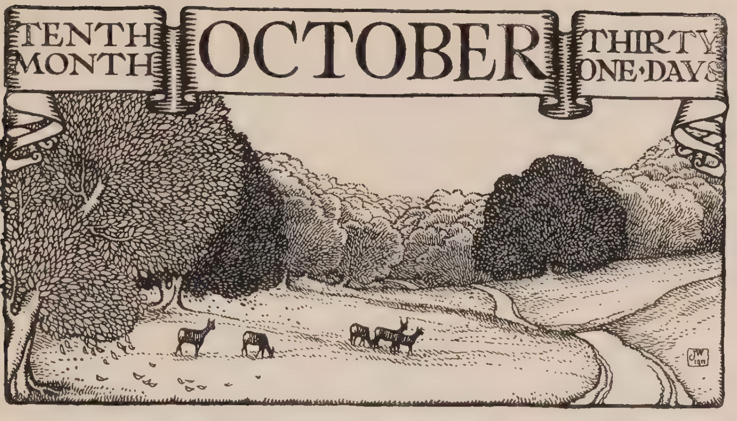
Tentacles on Leaf of Sundew (magnified)

1, Leaf with half its tentacles over a captured insect. 2, Leaf with all its tentacles curved in towards the middle. 3, Leaf with all its tentacles extended.

Sundew emits acid juices which cause it to assimilate small particles of flesh.

*Nature Study for the Month:*

1. Seed Formation.
2. Seed Dispersal.
3. Fruits.
4. Hips and Haws.
5. Sundew.
6. The September Woodlands.
7. The Weasel Family.
8. The Fox.



Where are the songs of Spring? Ay, where are they?
Think not of them, thou hast thy music too,—
While barred clouds bloom the soft-dying day,
And touch the stubble-plains with rosy hue;
Then in a wailful choir the small gnats mourn
Among the river sallows, borne aloft
Or sinking as the light wind lives or dies;
And full-grown lambs loud bleat from hilly bourn;
Hedge-crickets sing; and now with treble soft
The redbreast whistles from a garden-croft;
And gathering swallows twitter in the skies.
—*J. Keats.*

Truly, Autumn, "thou hast thy music too"! Keats, the great Nature poet, has grandly apostrophized this beautiful season; and there is not one word of exaggeration in his poetical imagery. The boughs of trees are groaning with the weight of luscious fruit—"painted spheres, streaked and mottled and barred, glowing like jewels among the branches". Now are the days of vintage. The corn has already been safely garnered, the hop poles have been divested of their clinging burdens, and nothing remains but to pile the apples, pears, and plums in baskets, and safely house them for the coming winter.

There will be little difficulty this month in procuring a varied collection of "nature-study" objects. Even in town and city it is possible to obtain specimens of foliage touched with the hues of autumn, which will serve to illustrate studies of "Leaf Coloration". Various kinds of nuts are available, vegetables of many sorts, and numerous fruits, such as apple and pear, peach and plum. Books, though they can assist in the acquisition of nature lore, should only be guides to personal observation.

As this season is especially set apart for fruits, we will start the month with a brief description of the formation of fruit.

## Fruits

Last month we discussed the dispersal of seeds, and in this chapter it will be useful to give a thought to Nature's protective covering of the seeds, which is all that fruit really is.

Blackberry, and single Fruitlet of same

The latter is enlarged and cut through to show the seed.

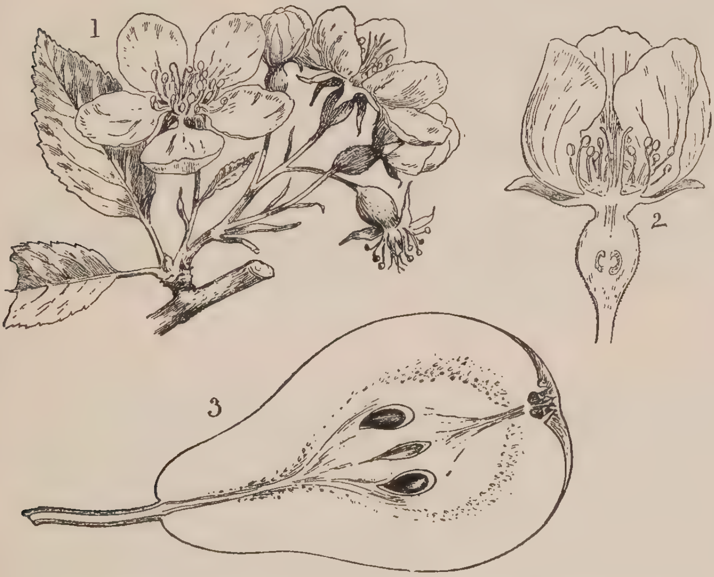
Superficially the flowers on the flowering plants and the fruit on the fruit-trees appeal as the chief products of those plants and trees. Not so in Nature. The beautifully coloured petals are to attract the insects so that cross-pollination follows. The seeds and pips of fruits are of far greater importance, from Dame Nature's point of view, than the fleshy and luscious pulp surrounding them. This must be borne in mind as a preliminary to our studies.

A general classification of fruits has been made in the last chapter. (See p. 17.)

Another classification of fruits could now be made, that is: (*a*) *simple* fruits, (*b*) *compound* fruits. Simple fruits are those which were formed from one carpel or seed-vessel. In the pea there is only a single carpel in each flower; therefore when the ovary is ripened there will be a simple fruit. Many other flowers, as the Blackberry and Buttercup, possess many carpels; thus we obtain many fruits.

**The Pear.**—At this season of the year there is no more common fruit than the Pear, and a thorough study of this fruit will repay itself.

When studying fruits, one should always bear in mind the earlier flowers, so that a thorough connection between the two is established. Make it a kind of mental exercise to follow in thought the stages of bud, flower, insect pollination, disappearance of petals, stigma, and style, and the ripening of the ovary. It does not take long to review this, and it forms a link between flower and fruit, cause and effect, for all time.



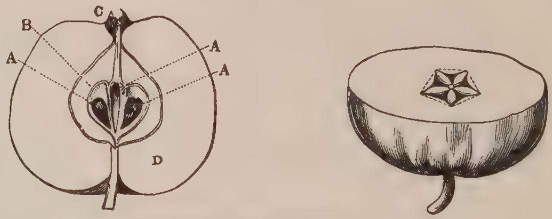
**1, Pear Blossom. 2, Section of single flower, showing ovary. 3, Section of Pear, showing seeds.**

The Pear belongs to the important Rose family. (This description seems to me to be preferable to saying that the Pear is a member of the genus *Pyrus.*) As we see on p. 146, the flower of the Wild Rose has five petals and five sepals. The pear blossom has the same number, together with many stamens and five carpels.

Sometimes the pear tree blossoms twice. If so, you might be able to obtain the fruit and blossom simultaneously, which, of course, would be very helpful.

A vertical section of the flower and flower base shows us five separate chambers, and there are two ovules in each chamber. The five styles are also separate.

As these chambers develop, the walls of each of them become very tough. This tough lining is known as the *endocarp*. It thoroughly protects the pips, which are the future life of the plant. Thus these pips have three protective layers; first, the tough endocarp, next the fleshy fruit, and thirdly, the tough outside skin.



Apple cut Downwards and Across

A, Seed. B, Endocarp. C, Calyx. D, Soft, edible part.

**The Apple.**—This fruit also belongs to a tree which is a member of the Rose family. The tree was originally obtained from the Wild Apple or Crab. (Of course all fruits, flowers, &c., were formerly wild, and long cultivation of them in gardens has greatly improved them in size and brilliance of colour. The science of grafting can produce some truly wonderful results; sometimes two or three quite different varieties of apples are found on one tree, owing to the grafting of the various shoots on different branches.) The tree may be propagated by seeds or pips, but in nearly every case new trees are formed by grafting.

Note the five seed-boxes arranged in the shape of a star in the centre of the fruit. (It would be better to cut an apple across at right angles to the core.) Note the pips in the seed-box, and also the dried sepals on the top of the fruit.

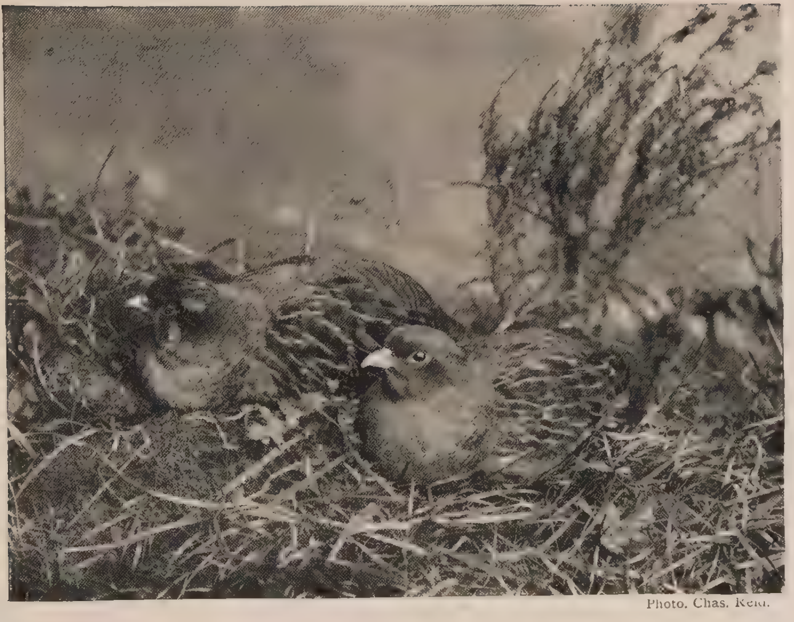


Photo. Chas. Reid.

PARTRIDGES

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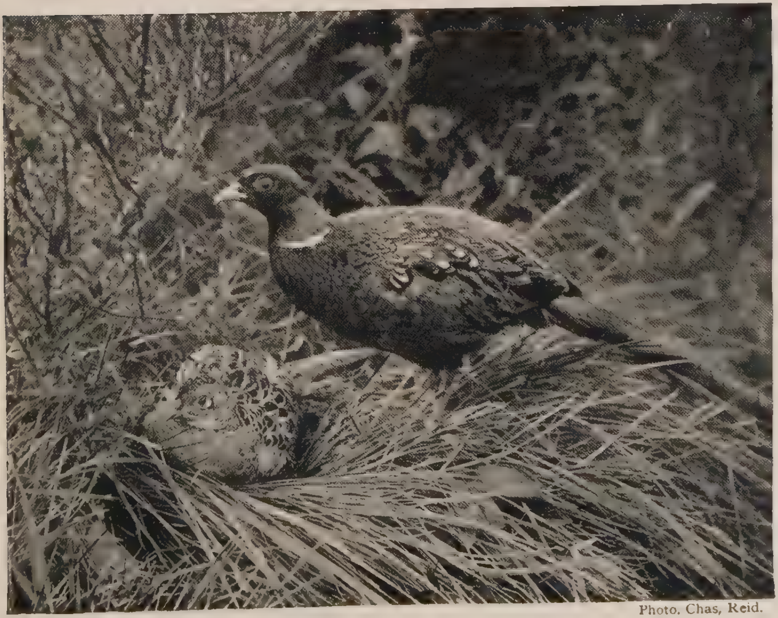

Photo. Chas, Reid.

PHEASANTS

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# The Partridge

Strictly speaking, this belongs to the chapter on September, for, as partridge-shooting begins on September 1, the birds are then much in evidence on the poulterer's stall.

This is the season of what are called partridge "drives". Unlike the pheasant "shoots", which take place on the outskirts of the wood, those of the partridge occur on the stubbled fields. Sometimes the "guns" walk with the "beaters", while at other times they hide themselves behind a hedge, and the birds are driven over their heads.

The young birds, which are hatched in May, are rather delicate, and should the weather be at all wet many of them are drowned. The nests are always in exposed positions. The broods are sometimes raised in the open fields; but more often the nest is built on the bank of a hedgerow, or in a low ditch. It is not at all an artistic structure. A large amount of dry grass, leaves, &c., is collected and placed in a heap, when the mother bird scoops out a hole in the centre large enough to sit upon. One may distinguish the mature male from the mature female by the rich chestnut horseshoe patch upon the breast of the former. An average bird would weigh about a pound, and measure about a foot from head to tail.

The eggs afford a good example of colour protection in nature, for one could pass them by quite easily without noticing them. They are of a grass colour, with brownish blurs on them. The mother bird often lays a dozen eggs.

The young birds have very many enemies other than the wet weather. Thousands of them are devoured by the stoat and weasel, or the prowling owl and hawk. Sometimes a desperate battle takes place between the parent birds and these intruders, but the partridge invariably gets the worst of it.

The little birds are soon taught the way to protect themselves by crouching down among the herbage. They prefer company, and are mostly seen in "coveys" of ten or a dozen birds.

They live on many kinds of small insects, such as ants, slugs, caterpillars, cocoons, and larvæ of all kinds, thus doing much good to the farmer by ridding the fields of many of these undesirable insects.

The birds are considered a fine delicacy for the table.

## The Pheasant

October 1 is the date fixed by law when pheasant-shooting may commence. There is a very good reason why partridges and pheasants are not allowed to be killed before September 1 and October 1 respectively, namely, to allow the birds to bring their young to maturity.

We may almost call the male pheasant the king of English birds so far as beautiful plumage and size are taken into account. It is quite easy to distinguish the male and female, for the latter is of a much more sober hue than her mate. Even the brilliance of our English cock-pheasant is surpassed by the beautiful colours of the Golden Pheasant of Tibet and China, and Amherst's Pheasant of the same countries. The pheasant builds its nest on the ground or at the bottom of a hedge during spring. It is made of loose twigs lined with dry grass. The eggs are slightly larger than those of the partridge. Sometimes the latter bird chooses the pheasant's nest in which to lay her eggs, and it has been frequently known that the hen-pheasant brings off a mixed brood of partridges and her own offspring.

Cock-pheasants have spurs on their legs. Note that the wings are short when the size of the bird is reckoned, but the tail is extremely long. This tail is often used as an ornament for ladies' hats. The three front toes have a very thick membrane which unites them up to the first joint.

The birds have rather a clumsy action when on the wing. They fly very little, and pick up their food (insects, grains, &c.) as they walk on the ground. They seldom take to wing unless alarmed, and then they form a splendid target for the sportsman's gun.

# Nut-bearing Trees

October is undoubtedly the best month in which to give attention to the study of nuts. Countless specimens may be obtained, but for our purpose these should be accompanied by the branch or twig on which they grew. If this be impracticable, then the husk or outer shell should certainly be brought.

Perhaps the most common British nuts are the Hazels. The proper place in which to search for them is the woods, but when the season is favourable they are to be found in great numbers on the hedgerows.

A nutting excursion is one of the most delightful forms of country holiday.

Wordsworth describes such an expedition in "Nutting":

I left our cottage-threshold, sallying forth
With a huge wallet o'er my shoulders slung,
A nutting-crook in hand, and turned my steps
Toward some far-distant wood. . . .
I came to one dear nook
Unvisited, where not a broken bough
Drooped with its withered leaves, ungracious sign
Of devastation; but the hazels rose
Tall and erect, with tempting clusters hung.
. . . . . . . . . . . .
Then up I rose,
And dragged to earth both branch and bough, with crash
And merciless ravage. . . .
I felt a sense of pain when I beheld
The silent trees, and saw the intruding sky.—
Then, dearest maiden! move along these shades
In gentleness of heart; with gentle hand
Touch—for there is a spirit in the woods.

When I was a boy one of my schoolmates could obtain permission from his father, a gamekeeper, to take me with him into the heart of the wood. I remember, now, the majestic grandeur of the trees surmounting the low hazels far beneath them. Leaves of all shapes and colours surrounded us. A deathly silence, at times broken by the curious cry of the pheasants, or the tapping of the woodpecker on the rotting trunk of some tree, was manifest. I would strongly recommend all of my readers, if they be lovers of Nature, to visit the autumn woods.

Besides enjoying their beauty, study what you see there in the light of what you have already learned of catkins, flowers, and so on. (For the male catkins and the tiny female flowers of the Hazel see p. 100.) The leaves are broadly obovate, and they have taken a rich yellow colour. (Refer to section on Leaf Coloration.) As the hazel is extremely hardy, the leaves will not fall until long after those of other trees are buried and forgotten. I have frequently seen a hazel shrub in nearly full leaf up to within a fortnight of Christmas.

The wood of the Hazel is tough and elastic and will easily split. For these reasons it is extensively used for the making of hurdles, and it is also manufactured into crayon and gunpowder charcoal. Reference could be made to the Hazel as a "divining rod". This is a rod made of two forked branches for the supposed purpose of discovering springs of water under the ground, or even minerals. A graphic description of the person carrying the divining rod slowly over the ground by its forked ends could here be given. When the hidden water or mineral was reached, the rod, by some strange power, was affirmed to dip, quiver, and point downwards. Whether there is some subtle connection between the two has been the matter for much argument, but certainly some wonderful examples of its efficacy have been established.

Readers should be warned not to go nutting before the nuts "slip shell", if they wish to keep them, as they are not fully matured until their husks die off.

Many of the nuts are hollow, and a tiny hole, a little larger than a pin's head, may be seen in the shell. This was made by the nut-weevil in the early summer when the nuts were soft and immature. The weevil is a tiny beetle which has an extremely sharp snout or proboscis, so that it is able to bore its way through soft structures. It may be seen crawling about the hazels in June and July. Its grub feeds on the Hazel, so the mother weevil lays her eggs there. She chooses a nut, and bores a tiny hole through the soft shell into the pulpy material inside, and drops her egg in it. In time the egg is hatched, and the ravenous grub appears. He, however, is a prisoner, for his fat little body is too large to escape through the hole. He feeds on the soft kernel of the nut, and in autumn bores his way out in order to prepare for the next stage in his development. This accounts for the fact that you rarely find a weevil in a hollow nut. Reference should certainly be made to the squirrel garnering his winter store, and the reader might be reminded of the well-known poetical description of him:

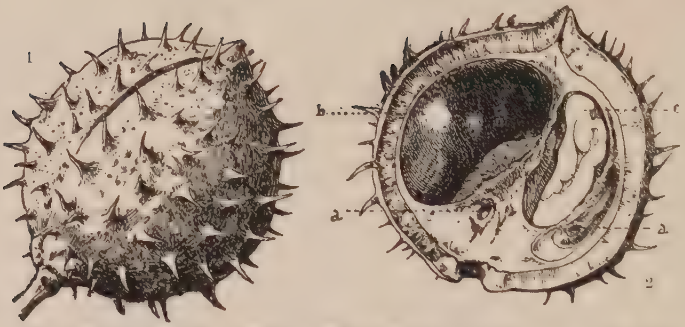
> Upon whose nutty top
> A squirrel sits, and wants no other shade,
> Than what by his own spreading tail is made;
> He culls the soundest, dext'rously picks out
> The kernels sweet, and throws the shells about.

## The Horse Chestnut

How dear to the hearts of schoolboys are the "conquers"! You will have little difficulty in obtaining innumerable specimens of these. What hagglings and bickerings take place over them! Doughty warriors some of them; heroes of a hundred fights! Baking and roasting become a fine art, and no knight of old could look upon his trusty lance more lovingly than the British schoolboy does upon his "good old conquer".

The glory of the Chestnut in flower has long since given way to beauty of another kind. The leaves are now yellow, and the flowers have changed to pendulous catkins. The gaudy colouring of the flowers attracted countless insects, and pollination was easily effected. The withered petals left behind them the little green boxes at their base, which gradually developed until they reached the size of a small apple.

The extremely thick protected case should be dissected



1, Horse Chestnut in Pod. 2, Section of Horse Chestnut, showing, *a a*, seeds which have not been fertilized by pollen; *b*, whole seed; *c*, section of seed.

and studied. It is extremely beautiful, green outside and inside snow-white.

Some of the cases may have split open. This is Nature's way of dispersing the seeds for reproduction of their kind. Readers will understand that if these seed-cases did not split when the nuts were matured, then, when they fell from the tree, the case would rot and cause the nut to do so too.

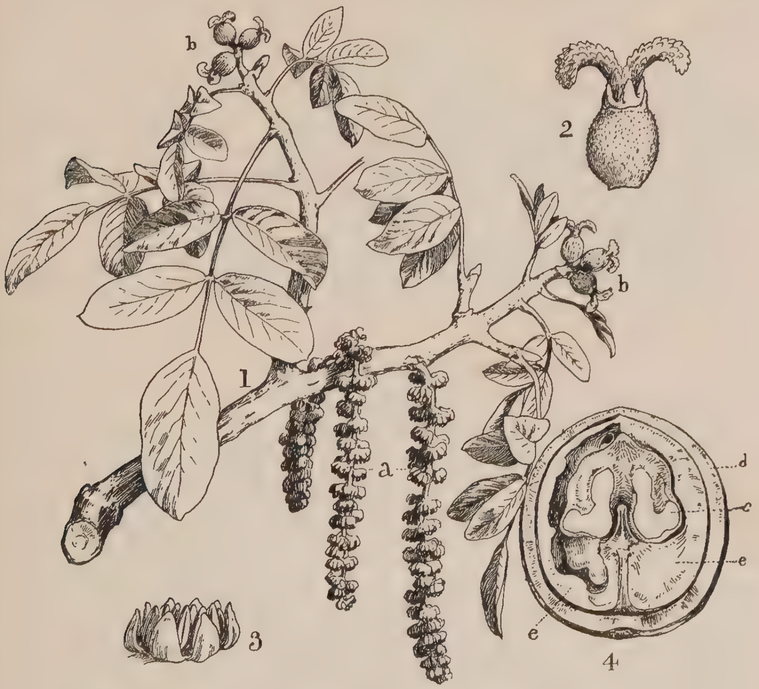
The Chestnut tree is by no means one of the oldest of British trees. It did not arrive in this country until the seventeenth century, when it was brought from the south-east of Europe. On account of its great height and beautiful spreading branches, together with its lovely blossom, it is now one of the most popular of our trees from an ornamental point of view, but its wood is of comparatively little value.

Farmers frequently give their cattle chestnuts to eat when they have coughs, and goats, sheep, deer, &c., look upon the rich, brown fruit as a great delicacy.

## The Walnut

Remember the smooth, compound leaves which were unfolded from the buds in spring, and also the blossom developed in May, which appears before the leaves. Contrast the blossom of the Walnut and Chestnut trees. Also pay attention to the pungent odour of the leaves when they are bruised, and the deep dye which exudes from the husk of the nut.

Male and female flowers appear quite separately on the same tree. Note the necessity of wind and insect pollination here. Compare with the distinct male catkins, and red-tipped female flowers of the Hazel. Remember that these *monœcious* plants, as they are called, are rarely self-pollinated.



1, Branch of Walnut. *a*, Male flower; *b b*, female flowers. 2, Female flower. 3, Male flower. 4, Section of Walnut. *c*, Seed; *d*, green husk; *e e*, shell.

Some of my readers may have been walnut "dashing", as rurals call it. Long poles are taken, and the nuts are beaten from the trees. In many cases they are obtained before they are ripe, in order to make the valuable walnut ketchup. The making of this ketchup is an interesting process, but space forbids a description in these pages.

The green *epicarp*, which encloses the nut and *endocarp*, is exceedingly bitter. The reader may contrast the irregular manner in which this epicarp splits, when the nut is matured, with that of other fruits.

Walnuts are very agreeable to eat. They are a valuable dessert. Note the tough woody shell. Thus the nut is wonderfully well protected.

The trunk of the tree is of a greyish colour, and, in the case of old trees, it is very rugged. When properly seasoned the wood takes a beautiful polish, and its beautiful dark-brown grain causes it to be in great demand by furniture makers.

## Beech Nuts

Just as the value of the Horse Chestnut tree lies in its stately grandeur and gaudy blossoms, while that of the Walnut is contained in its beautifully grained wood and edible nuts, so we appreciate the Beech chiefly on account of its beautiful emerald leaves in spring, and their rich brown and orange in autumn. Some of the latter leaves have been collected and used in the stuffing of cheap mattresses.

The wood of the Beech tree is in great demand for handles of carpenters' tools, and as it remains well preserved under the action of water, it is frequently used as piles for bridges or dams in rivers.

You may well wonder at the extreme age of some of these forest trees. The Beech does not reach its prime until it is nearly one hundred years old, while the Oak is still older. It is interesting, if you have imagination and some knowledge of the history of the locality, to "make the trees speak". Imagine the old oak being endowed with human intelligence, relating the development of the countryside from rustic fields to suburban building plots, the immense progress of invention in all branches, and so on.

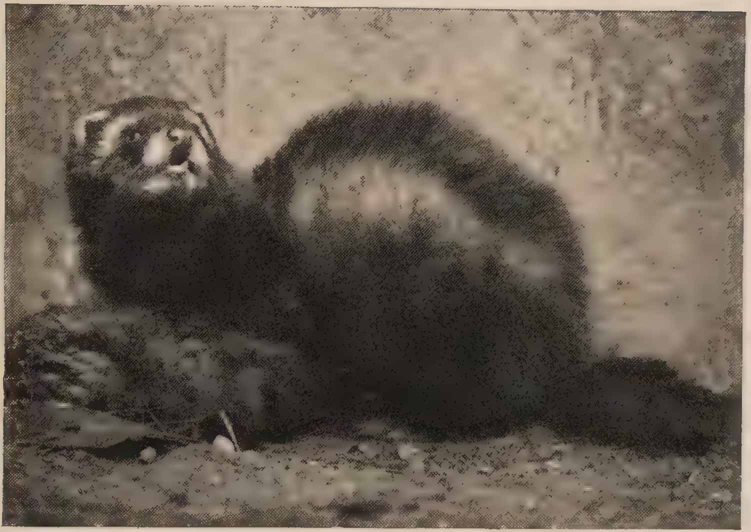


Photo. Douglas English.

POLECAT

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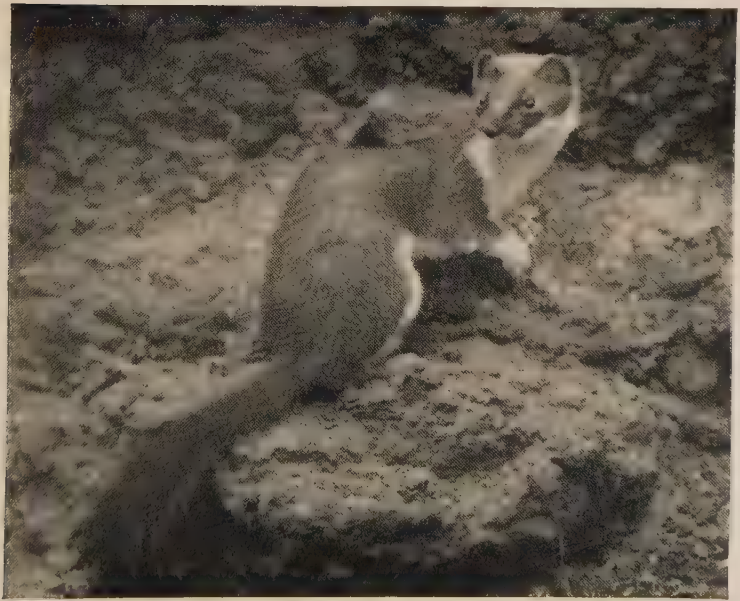

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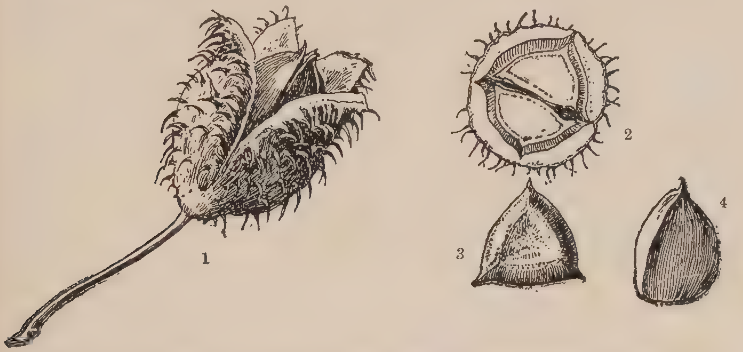
Photo. Douglas English.

STOAT OR ERMINE

*Page* 13

The smooth bark of the Beech provides a great attraction for the "initial carver". Note how harmful this is to the bark of trees (see p. 85).

The fruit of the Beech consists of the familiar three-cornered nuts, of which two are found in a husk. Note the manner in which the husk splits when ripe—into four parts. The fruit is much sought after by pigs and other animals, and occasionally it has been ground into a powder and used as a substitute for coffee.



1, Beech Nuts in Husk. 2, Section of Beech Nut, showing two seeds. 3, Beech Nut, bottom view. 4, Beech Nut, showing two sides.

## Leaf Coloration

Bright yellow, red, and orange,
The leaves come down in hosts;
The trees are Indian Princes,
But soon they'll turn to ghosts.
—*Allingham.*

I have previously remarked on the varied hues of the autumn leaves. Specimens of various shades, such as the yellow leaves of the hazel, the purple creepers, and so on, should be before the reader.

During August and September the stem has been drawing valuable substances from the leaf into the twig. There has thus been a kind of winter storage going on. There is, too, a cessation in the manufacture of *chlorophyll*—that green substance of the leaf which is of such great value as plant food. The greenness of the leaf therefore gradually fades away.

This hitherto predominant green colour now discloses all the submerged colours in the leaf. Leaves contain a yellow colouring substance—the *xanthophyll*—and thus, when the green is withdrawn, the yellow appears.

Scientists also tell us that an entirely new substance, known as *erythrophyll*, is made from the sugar and tannin of the decaying leaf cells, and this has a red or purple colour. A brown substance is formed in certain leaves as well. Thus the combination of these colours gives the autumn leaves their beautiful tints.

Whenever the leaf is injured in any way the action of the chlorophyll grains ceases, and this accounts for some of the leaves of a tree changing colour long before their time.

The reader will realize that the leaves of deciduous trees could not withstand the extreme cold of winter, and that the trunk and twigs require all the food they can get for the formation of winter buds; thus the leaf is sacrificed.

*Nature Study for the Month:*

1. Fruits—the Pear and Apple.
2. The Partridge.
3. The Pheasant.
4. Nut-bearing Trees.
5. The Horse Chestnut.
6. The Walnut.
7. Beech Nuts.
8. Leaf Coloration.

*Flowers of the Month:* Toadflax, Pennyroyal, Autumn Crocus, Cornmint, and Wood Sage.

*Fruits of the Month:* Hips, Haws, Rowans, Guelder Rose, Nuts (including the hazel, filbert, beech, walnut, horse chestnut, &c.).

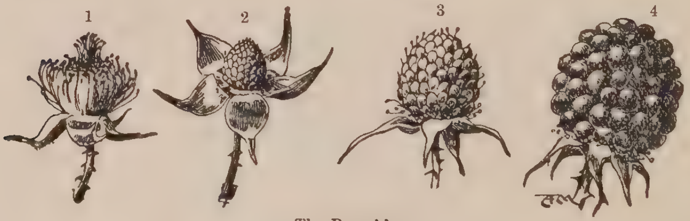
The groves were God's first temples. Ere man learned
To hew the shaft and lay the architrave
And spread the roof above them, ere he framed
The lofty vault to gather and roll back
The sound of anthems, in the darkling wood,
Amid the cool and silence, he knelt down
And offered to the Mightiest solemn thanks
And supplication. —*W. C. Bryant.*

The season of fogs, with its rapidly decreasing daylight, is upon us. Nature is drooping to decay; most of the leaves have changed colour, and nearly all have fallen. The winds already have the ice of winter in their breath, and the sun's rays are weaker and paler, as they struggle through the gathering mists. Animals are busily preparing for their long winter sleep. Already the squirrel has garnered his store of nuts and berries, and carried them to the foot of the hollow tree. All Nature seems to be preparing for her apparent inactivity, for although much work is being carried out in plant life, yet there is little visual evidence of it.

Some of the subjects of which I propose to speak this month would, perhaps, be more suitably included in an October chapter. Of late years, however, our summers have been long delayed, and as vegetation is regulated by the weather, and not by the calendar, it is quite possible to devote attention to such autumn fruits as the Blackberry, and other products of the Bramble family, together with the numerous fungi growing in the woodlands during November. Whatever the weather be we may always meet with some of our winter migrants during this month, and a visit to the woodlands will acquaint us with the formation of winter buds.

## The Common Bramble

Specimens of the Bramble itself, together with clusters of blackberries, and, if possible, flowers of the same, should be obtained. You will enjoy an expedition in search of these, and you should take advantage of the opportunity to study the growth of the Bramble, its way of taking root, the length of time for which its leaves keep their green colour, and so forth.

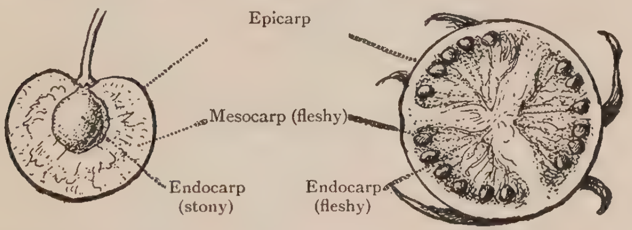


The Bramble

1, Berry and stamens. 2, Same, with stamens removed. 3, Unripe berry. 4, Ripe berry.

The Bramble is a good example of a biennial (for description of biennial see p. 107). It bears pretty white or pink flowers in spring, somewhat similar to those of the Strawberry. The bright petals attract the insects and pollination quickly takes place. The carpels rapidly develop, and in time become large fruits, each of which contains one seed. You should take a blackberry and dissect one of the little black juicy globes from the cluster. If you bite it you will find one tiny "stone" or seed inside. Each of these little fruit globes is called a *drupe*. Thus you will see that a blackberry is really made up of a *cluster of drupes.* In this manner you will easily see for yourself how each individual drupe came from one of the numerous carpels in the flower.

A short description of a drupe might now be given. Briefly stated, it is a fruit in which the outer part of the pericarp softens, while the inner part hardens like a nut, forming a stone containing a kernel. Excellent examples are of course to be had in plenty amongst the common stone fruits, as the peach, plum, apricot, cherry, sloe, &c. (It might be well to give now the botanical terms for the various parts of the fruit, for, though they need not be a worry to the reader, yet they may occur in future chapters. The *pericarp* is the case which encloses the seed. It is sometimes made up of other parts. For example, the outside skin of the plum is the *epicarp*, the flesh the *sarcocarp* or *mesocarp*, and the stone the *endocarp*.)



Section of Drupe (Cherry)

Section of Berry (Tomato)

The stem may now be examined. It has numerous sharp, curved, and strong prickles. How are these prickles curved? Downwards. What other plants have prickles? Of what use are they? They protect the plant from browsing cattle, and they are used for the purpose of climbing. The prickles are really outgrowths of the skin of the stem. Contrast them with the gorse spines, which are really produced from leaves. What does the Bramble do when it has climbed to the top of the hedge by its prickles? It forms a graceful arch bending over towards the ground.

## Other Autumn Berries

The varieties of autumn berries are so numerous that to describe them all at once would not only tend to confuse the reader but would entail the devotion of a disproportionate amount of space to the subject. I therefore confine myself to one or two.

Common Elder: Foliage, Inflorescence, and Fruit

Dwellers in mountainous districts will be quite familiar with the **Cloudberry**. The flower of this shrub is very similar to that of the Blackberry, while the berries are rather smaller and of a rich orange colour. The leaf is rather large for the size of the plant, which only reaches a height of 7 or 8 inches, and it is nicely serrated.

The **Butcher's Broom**—so called because the stems, when bound together, were used as besoms or brooms by butchers—is an evergreen which produces a small red berry. It is a very common shrub, about 2 feet in height. The flowers are of a green hue, and are rather insignificant.

The **Elderberry** is the fruit of the very common Elder-tree. The flowers are of a creamy-white colour and look very pretty in June. Small black berries succeed the flowers, and are often made into wine. The shrub is a greedy feeder, and frequently kills other plants in the vicinity by extracting all the plant food from the ground. The leaves have medicinal properties, and are used as an emetic.

The **Rowan-tree**, or **Mountain Ash,** is noted for its beautiful scarlet berries. It is closely allied to the Pear and Apple trees. The berries are very bitter and not pleasant to eat, but a valuable dye is extracted from them. The tree and berries are used for decorative purposes. It may often be found in the vicinity of ancient cromlechs, as it is said to have been used in sacred rites by our pagan forefathers.

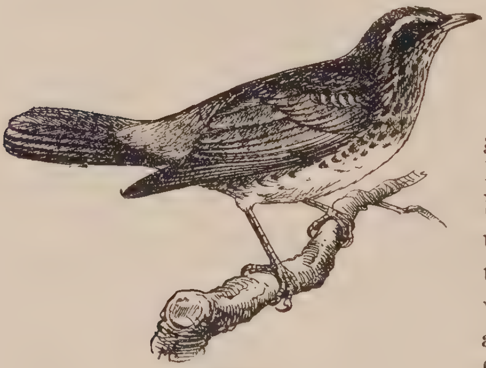
The **Dewberry** may often be found in Suffolk hedgerows. It is much like the Common Bramble, but the berries are rather smaller and have a "tarty" taste. There is invariably a beautiful bloom on them which closely resembles dew, hence its name.

Other autumn berries are the crowberry, bilberry, bird cherry, and buckthorn; but it is inadvisable to crowd too much into one chapter, and those I have given are the most common and most sought after.

## Winter Migrants

As an experiment, ask some of your friends to quote to you a list of migrants. If they had not previously given a thought to the subject they would probably include the cuckoo, swallow, martin, and perhaps two or three others. But, strange to say, they will tell you only of those birds which leave these shores in autumn and return in spring. Seldom do they tell of any of our northern visitors which arrive here during the autumn and spend the winter with us.

Before going any further with the subject let us consider the reason why birds migrate. There are two main causes, one of which is that the climate in which they pass the summer is too cold for them in the winter, and the other, that their natural food is not abundant in the winter. These causes refer to both our summer and winter visitors, for to the former, who "seek the shades of Memphis" in our English winter, the cold is quite as severe as the rigors of a Siberian winter are to the latter.


Fieldfare

When our summer visitors are collecting in their favourite haunts preparatory to making their long flight, there begins to stream over the North Sea a steadily increasing multitude of winter migrants from Northern Europe. Their numbers entirely depend upon the severity of the weather. Should we have a very warm autumn, then our feathered visitors are comparatively few, but if the winter sets in prematurely, vast flocks of them appear.

Two of our most common visitors are the **Fieldfare** and the **Redwing**, both allied to the Thrush family. Indeed, the latter might easily be mistaken for a Song Thrush, as it is about the same size and has similar habits. When it first arrives it devours an enormous number of insects, but as these disappear, it resorts to the hedgerows and feeds on the berries. It is a rather delicate bird, and thousands of them die off if there be a cold "snap" for any length of time.

If the Redwing could be mistaken for a Song Thrush it is certain that the Fieldfare would be confused with the Missel Thrush. This bird likes company, and is seldom seen alone. It frequents the open fields, seeking for dainty morsels in the newly ploughed land. To see a flock of fieldfares in flight one would imagine that they had a strict drill sergeant. They fly like a machine, all at the same pace, all with their heads pointing in the same direction. Even when they settle on a tree, each bird faces the same way as the rest of the flock.

Another very pretty winter migrant which I have often seen in Norfolk is the **Snow Bunting**. It generally arrives just before Christmas, and frequents the Broads. It is of a whitish-brown colour. When it appears early in the autumn, the country people predict a severe winter. It nests in the cold regions of the far north, but nests have been found on some Scottish mountains. It has a sweet song, and, when on the ground, it runs about much like the lark.

The **Bittern** used to be a frequent visitor, but our so-called "sportsmen" proved very poor hosts, as the bird was a favourite target for their guns. The bird is protected by law, but its appearance in most districts is now so infrequent that when it is seen there is generally a Press notice of it. The bird has the curious habit of standing in a humpbacked position. It is rather ponderous in its build; the wings are comparatively short and the legs long. Indeed, it is a typical wader, as it also has a very long beak, quite 4 inches in length. It makes a curious booming or bellowing cry.

Other winter migrants include the siskin, woodcock, and large numbers of wild duck, chiefly appearing on the marshes and broads of the East Coast.

Here a timely word must be included on the charity and importance of feeding birds in the winter. The appearance of our visitors is a great strain on the food-supply, and many of our poor little robins, thrushes, &c., have to go short.

## Mushrooms and Toadstools

In these pages I do not intend to introduce a string of botanical names of the various fungi, but rather to give the simple broad outline of the whole class, together with a few distinctions between edible and other varieties.

You would find it interesting to collect a few specimens, as they are very plentiful this month. These could be mixed up indiscriminately for purposes of comparison and contrast.

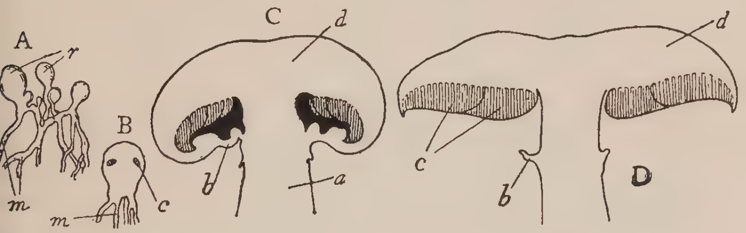
Common Mushroom

Perhaps it would be well for the reader to make a sketch of the fungus before his study begins. Nothing impresses the mind so much concerning the form and proportion of objects as does a drawing of it. You may point out to anyone that a particular fungus is umbrella-shaped, that the stipe is encircled by a collar, and so on; but he will have a much clearer conception if he has to use his eyes for the purpose of accurately reproducing its shape on paper.

The fungus has a cap and a stem. Generally the upper surface of the cap is convex. It has no leaves. (This at once will arrest your attention, for in your dealings with flowers or vegetables you have always spoken of leaves.) Refer briefly to the function of leaves as feeders of the parent plant. How, then, does the fungus make up for this? It has to obtain its food by the innumerable fine white threads at the base of its stem called

**Hyphæ.**—These threads feed on decayed vegetable matter. When does the fungus grow quickest? At night. Why is this? Because, unlike other plants, the fungus requires no sunlight to make the chlorophyll for its leaves (see p. 34), and it thrives best in damp soil when the dew or rain moistens the earth. Everyone of course knows how extremely fast fungi grow. Overnight nothing may be seen of them, but next morning dozens of small ones appear which rapidly develop into specimens as large as an orange.

The latent faculties of observation may be trained by such questions as these: Is there a knob on the top, or a hole? Does the edge of the skin curl under, or leave off sharply? Are there any scales or warts on the skin? What is the difference in colour between the cap and the stalk?



A, Portion of the Mycelium, *m*, of the Common Mushroom, with young "mushrooms" *r*. B, Longitudinal Section of Young Mushroom. *m*, Mycelium; *c*, points where gills are developed. C, Longitudinal Section of a Half-grown Mushroom. D, An Older Stage of C. *a*, Stipe; *b*, the veil; *c*, gills; *d*, fleshy part.

After the appearance and features of the outside have een carefully observed and noted, the cap of the fungus hould be inverted, and the characteristics of the under ide studied. The arrangement of the gills is worthy of ttention.

The junction of the gills to the stalk, or otherwise, is most mportant. In some cases the gills are joined directly to the talk; in others, they leave off just before they approach the talk; while in still more cases the gills are decurrent, that s, they join the stalk low down after making a downward urve.

The stem may now be dissected, and its texture analysed. robably maggots may be discovered embedded in it, as the ungi are a great attraction for certain kinds of these pests.

Follow the stem down to the hyphæ. Very many tiny white knobs may perhaps be visible. These are the young mushrooms.

How do mushrooms grow? In rings. Why is the grass discoloured? Because the hyphæ starve the roots, and they do not obtain enough nourishment.

Notice the seeds of the fungus, or *spores*, which are attached to the gills. You may detect the spores very easily if you place the cap on a piece of white paper and leave it there until next day. The spores will have fallen from the gills, and have made a perfect circle on the paper. So-called mushroom "*spawn*" is used by gardeners when they grow mushrooms. This is in the shape of bricks. Mushroom beds are always found in a darkened room or "frame" in the garden.

Take several specimens of your fungi and try to remove the skin from all of their caps. In some cases it will not "peel" at all; in others it will slightly peel; while in the case of edible fungi it comes off in large flakes.

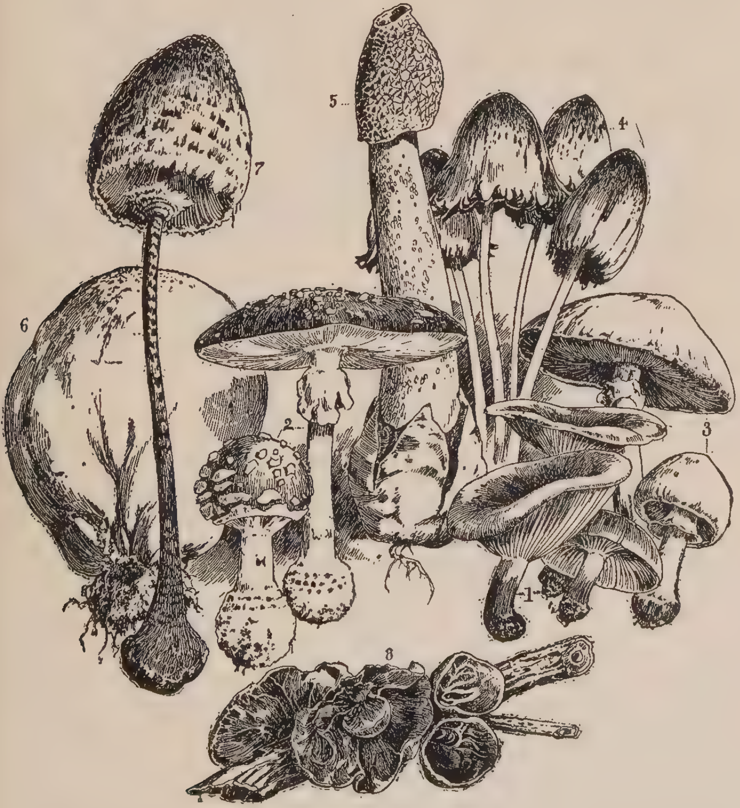
Another point worthy of notice is that in certain varieties of fungi there is a collar of skin around the stalk. When the young fungus was beginning to grow, both its cap and stalk were enclosed by the skin; but as it developed still more, it pushed its head out of the skin and left the collar, or ragged edge, on the stalk. This is one of the chief tests of a mushroom.

One of the chief uses of this chapter should be to demonstrate the characteristics of a true mushroom. Every year many persons are poisoned by eating fungi which they have mistaken for mushrooms. The chief distinctions are—

1. There is always a collar round the stem of a mushroom.
2. In young mushrooms the gills are of a pink, and afterwards rather purple, colour. They are never black.
3. The gills of a mushroom do not join the stalk. There is always a space between.
4. The skin can very easily be peeled off in flakes.
5. The mushroom has a pleasant odour. Some toadstools have a most objectionable scent.

# Classification of Toadstools

These fungi may well be classified with regard to the colour of their spores. This colour can, of course, be detected



1, Milky Fungus. 2, Fly Agaric. 3, Common Mushroom. 4, Ink-cap. 5, Stinkhorn. 6, Puff-ball. 7, Parasol Mushroom. 8, Jew's Ear.

easily by anyone if the experiment on the previous page be performed, and they may be arranged into a white, brown, purple, and black series.

### White Spores

*The Fly Agaric.*—This very poisonous toadstool, found in woods, generally near birch trees, but sometimes among firs, has a scarlet cap spotted with whitish warts.

*The Parasol Mushroom.*—This large variety grows in pastures and other open places. It has a scaly cap and stem, and is very much like an opened umbrella. It is edible.

### Brown Spores

*The Scurfy Agaric.*—This species has a yellowish-brown cap, shaggy with scales, and yellow flesh. It grows in tufts on ash and other trees, and has usually a very disagreeable odour.

*The Fragile Agaric.*—This is a very delicate species, with a longish stem and a rather small conical cap of an ochreous colour. It is common in pastures and gardens, in grassy places in woods, and by grassy roadsides.

### Purple Spores

*The Common Mushroom.*—The common edible mushroom is the best-known of the purple-spored kinds.

*The Horse Mushroom.*—A larger and coarser variety of the common mushroom, also edible.

### Black Spores

*Ink-caps.*—These grow in clusters on rotten stumps or decayed wooden fences.

Other varieties worthy of notice are the

**Stinkhorn** or **Stinking Morel.**—So called because of its noxious odour. When it first appears the fungus is oval-shaped, but a thin porous stem soon shoots up surmounted by a cap covered with a slimy substance.

**Puff-ball.**—This is a pear-shaped fungus which consists of a number of dry fibres and spores when it is matured. If it be pressed it will burst, and the spores will be scattered.

**Jew's Ear.**—Found on elders and elms. Has a smooth surface; but is wrinkled inside.

**Milky Fungi.**—These exude a milky fluid when crushed.

**Beefsteak.**—Has the colour of raw beef, and exudes a rich, red "gravy" when crushed. Found as a bracket on trees.

## Hibernating Animals

This is the time of year when all reptiles and many animals are busily preparing for their long winter sleep. A visit to the woodlands will probably show you the squirrel running along the firs and oaks gathering his store of nuts, berries, &c., and storing them in the hollow of an old tree. At this season he is extremely plump. What a change will have taken place by March! When he emerges from his fitful slumbers—for the squirrel, unlike many hibernators, wakes up at intervals—he will have an emaciated appearance, as he has been partly subsisting on his fat.

The reason why certain animals lie dormant is well worthy of consideration. The chief cause is that all hibernators are dependent for food upon insects, animals, fruits, &c., which are not to be found in cold weather. The reader will therefore see that it is a wonderfully wise provision of Nature which allows the animals to go into this state of coma, so that their species may be preserved. Many of our migratory birds can fly to sunnier lands in order to obtain their food; not so the reptiles and other animals, and unless they could lie dormant they would undoubtedly become extinct.

Dormant animals differ very much in the profoundness of their slumbers. I have seen a dormant bat, and also a coil of grass snakes—the latter often seek their mates and entwine themselves in a coil—which, to all appearance, were quite dead. A boy once brought a hibernating bat to school. It did not show the slightest signs of life at first; but after it had been in the warm room an hour or two it began slowly and feebly to stretch its wings and legs, and finally woke up completely. The squirrel sleeps and wakes alternately. On a warm day in January he may be seen down at the base of the tree in which he has made his cosy home, greedily eating from his store. He will soon feel drowsy again, and retire to his winter quarters.

During this state of torpidity the life functions are very feeble indeed. There is a great decrease of bodily heat, the temperature of the animal's body only just rising above that of the surrounding atmosphere. (You must bear in mind that the heat of the body depends on the action of the heart and lungs, and that when this is weakened bodily heat must decline. This explains the great difficulty old people, with poor circulation of blood, have in keeping warm.) The breathing is exceedingly slow, and the animals may be said to be "just alive".

The **Squirrel** is the wild animal with which we are most familiar, perhaps more by portraiture than by reality. With his beautiful eyes eagerly scanning the nut enclosed in his two little paws, his long bushy tail bent up against his back, his brown-red fur, and his tufted ears, he makes a pleasing woodland picture. His nest is frequently placed in a hole of the tree where the branch and trunk form a fork. When dormant, he is curled up with his tail wrapped round him much like a sleeping cat.

The **Hedgehog** is a very sound sleeper. He seeks out a nest in the bracken of the woods or heaths. He is supposed to be a weather prophet, for the old saw says:

> Observe which way the hedgehog builds his nest,
> To front the north, or south, or east, or west;
> For if 't is true what common people say,
> The wind will blow the quite contrary way.

He is a good scavenger during the warm months, building up the fat for his winter sleep by eating carrion, such as dead frogs, toads, worms, mice, and other small creatures. When very ravenous he will attack live animals. Woe be to the frog, mouse, or lobworm which crosses his path when he wakes up in the spring!

Photo. Douglas English.

SQUIRREL IN SUMMER PELAGE

*Page* 48

Photo. Douglas English.

HEDGEHOG CLIMBING

*Page* 48

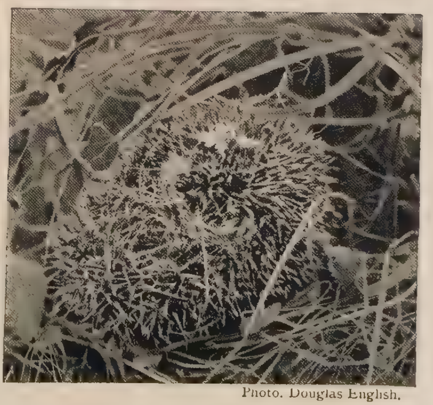


Photo. Douglas English.

HEDGEHOG CURLED UP

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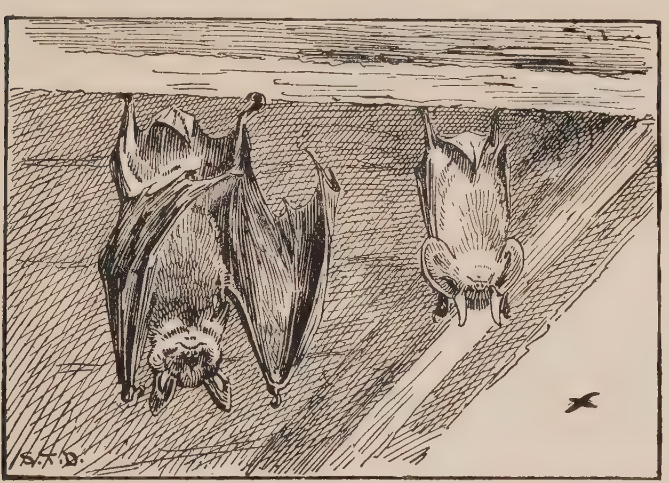
The **Dormouse** sleeps and wakes in turns. On warm, sunny days in winter he is tempted from his cosy corner, when he has a good meal on any vegetable food he can find, and then retires again. In appearance he is half a squirrel and half a mouse. He feeds on grains, small insects, caterpillars, and berries. Before winter sets in he collects a store in the grass of a bank, and near his hoard he makes a hole by burrowing in the mould. Here he sleeps for a week or two, and then wakes up to have a meal.



Bats Asleep

The **Shrew**, a little animal superficially resembling a mouse, goes to work in much the same way.

**Grass Snakes** and **Vipers** lie dormant during the cold months. They often seek out a hollow tree, and very frequently they wind themselves round one another and remain coiled up among the dry leaves. It was once my good fortune to see such a coil in the woods. The gamekeeper took their stiffened bodies up in his hand, but, with the usual boyish horror of snakes, I felt far from comfortable, especially as the reptiles appeared to have their eyes wide open. When dormant they have a glassy stare much like people who walk in their sleep.

The reason is that the snake has extremely thin and transparent eyelids. These eyelids are always closed, and only serve as a protection to the eyes. As they are transparent, we naturally conclude that the snake has no eyelids, and therefore its eyes are always "open".

The **Bat** selects the secluded corners of the barn, and hangs itself from a rafter head downwards. It falls into the deepest slumber, and frequently sleeps from November to April.

Tiger-beetles, sand-wasps, blindworms, spiders, and insects of all descriptions are snugly housed in the warm and sheltered banks, but, notwithstanding this, many thousands of them succumb to the winter cold. Frogs, toads, and newts have sought out the muddy bed of the pond where they will lie all winter, until instinct tells them that the weather is warm enough to reappear. None of these creatures wake by the calendar. Proof of this is to be found in the fact that if they be kept at an artificially low temperature they will sleep for years. An abnormally warm day in January will tempt many of the insects out, and hundreds of thousands of them meet their death in this manner, as a spring-like January day is frequently followed by a bitter frost, which attacks the delicate insects ere they have time to retreat to their winter quarters.

*Nature Study for the Month:*

1. The Common Bramble.
2. Autumn Berries.
3. Winter Migrants.
4. Mushrooms and Toadstools.
5. Hibernating Animals.
6. The Squirrel.

*Flowers of the Month:* With the exception of Ivy blossom there are no flowers suitable for elementary Nature study.

*Fruits of the Month:* Mistletoe and Holly berries (unripened), Rowan tree, Guelder Rose, and berries of the Brambles all make interesting studies.

The glossy holly lined the park,
The yew-tree lent its shadows dark,
And many an old oak, worn and bare,
With all its shivered boughs, was there.
Lovely between, the moonbeams fell
On lawn and hillock, glade and dell.
—*Sir Walter Scott.*

If you read this word picture over twice—if you read it softly, but aloud—you will quite see the December landscape as it appears to dwellers remote from town. Country and Christmas, and, therefore, country and December, are for all time inseparably linked. Many of the greatest writers have been stirred by the genial Christmas spirit. Our notions of what the season ought to be are still directly or indirectly influenced by Washington Irving's delightful descriptions in his *Sketch Book,* but our own Charles Dickens is of course the genius of the ideal English Christmas, with its snowy landscapes, blazing hearths, and happy faces. His incomparable Christmas scenes glow with light and warmth. The fireside plays a most important part in many of them. "Make up the fires and buy another coal scuttle", says Scrooge, and in other descriptions the Yule Log sheds its radiance o'er a crowd of happy relations as they recount their Christmas stories.

What a beautiful countryside picture does George Eliot give us in *Silas Marner*: "And so Silas spent his Christmas Day in loneliness, eating his meat in sadness of heart, though the meat had come to him as a neighbourly present. In the morning he looked out on the black frost, that seemed to press cruelly on every blade of grass, while the half-icy red pool shivered under the bitter wind; but towards evening the snow began to fall, and curtained from him even that dreary outlook, shutting him close up with his narrow grief. And he sat in his robbed home through the livelong evening, not caring to close his shutters or lock his door, pressing his head between his hands, and moaning, till the cold grasped him, and told him that his fire was grey."

Just one more word picture from one of Addison's inimitable "Letters to the Spectator", and I have done.

> "I have often thought," said Sir Roger, "it happens well that Christmas should fall out in the middle of winter. It is the most dead, uncomfortable time of the year, when the poor people would suffer very much from their poverty and cold if they had not good cheer, warm fires, and Christmas gambols to support them. I love to recognize their poor hearts at this season, and to see the whole village merry in my great hall. I allow a double quantity of malt to my small beer, and set it running for twelve days to everyone that calls for it. I have always a piece of cold beef and a mince pie upon the table, and am wonderfully pleased to see my tenants pass away a whole evening in playing their innocent tricks and smutting one another."

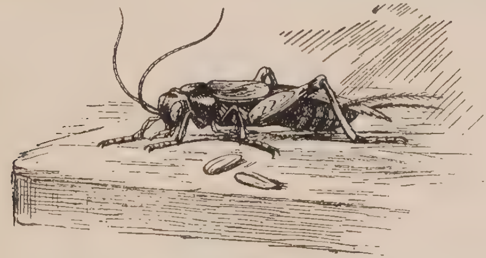
Winter is really upon us, and King Frost frequently has the countryside in his icy grip. The hibernating animals are sleeping through the cold months—some fitfully, others profoundly. Most of the migrants have arrived; the summer songsters have ceased singing, while those whose voices are heard especially in winter—such as the thrushes, augmented by their relations from the north, the redwing and fieldfare—are resuming their merry lays.

The cricket chirps merrily on the hearth; holly decorates the walls; mistletoe is suspended from the ceiling or from the lintels of the doors. Winter buds are swelling on the shrubs and trees, and the evergreens lend a touch of colour to the otherwise barren landscape.

Thus there is ample material for suitable Nature Study even in this, the chief of the "dead" months. Indeed, the season offers particular advantages for some departments of such study, notably that of trees. At other seasons, the foliage we admire conceals to some extent the characteristic growths of the various species. Revealed by the loss of leaves, the network of branch and twig has a beauty of its own.

## The House Cricket

This little insect, generally associated with domestic comfort, is often linked with December and the fireside, and this month seems an appropriate time for the devotion of some attention to it. Specimens, however, will be found exceedingly difficult to obtain.



House Cricket

The insect is about an inch in length, and its feelers extend about an inch and a half. It is of a yellowish-brown colour. In farmhouses, particularly those where the old-fashioned fireplaces are retained, its chirping is a familiar sound. This noise is produced by the wing-covers of the males, which are vibrated and rubbed together an enormous number of times a second. Some people rather like to hear this chirping noise, and Spaniards have been known to keep house crickets in cages.

The insect is rather lazy in its habits. It does not trouble to build a house, but takes refuge in cracks among the mortar or brickwork, generally by the fireside. In the summer it frequently leaves its retreat, and lives in the cracks in the ground caused by the dry weather.

The cricket emerges from its hiding-place at night in search of food. Any crumbs are greedily snapped up, and young cockroaches are destroyed. Sometimes it mounts the linen horse by the fireside and feeds on the woolly fibres of the stockings, &c.

The House Cricket has two relatives—the *Field* and *Mole* Crickets. Both are burrowing insects and very shy, so that it is a difficult matter to find them. A good way to capture one is to insert a small twig in its burrow, when, if it be at home, it will get upon the stick, and can be withdrawn. It is hard to tell where its burrow is. The best way is to go at sunset when it is in "full song" and watch it escape in the grass to its tunnel. Gardeners destroy the insects whenever possible, as they do great harm to the roots of young vegetables both by burrowing beneath them and eating them.

## Holly

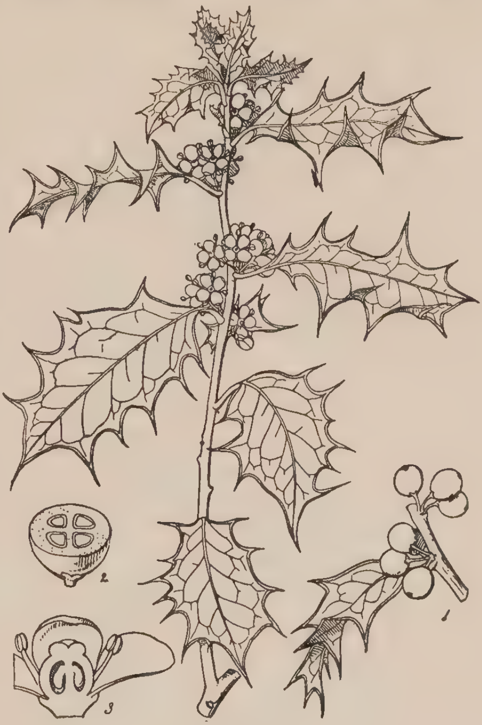
Of all subjects of Nature Study for December, nothing could be more topical than holly. Familiar as everyone must be with the appearance of its decorative foliage and brilliantly contrasting crimson berries, few perhaps could describe its flower or the details of its growth.

Why is it called an evergreen? Where does it grow? About how high is the tree? Questions such as these will serve to test the nature-student's powers of observation and reflection. The leaves may now be analysed. The observer will notice the extremely sharp points around the edges. The veins will be seen to run into these points. Notice how tough the leaves are, and see how the dagger-like points protect the shrub from browsing cattle. Among other plants which are so protected by spines, hairs, or prickles, are the Gorse, Nettle, and Bramble. (Lectures on

Animal Defence are very common, but little has been said on Plant Defence, though this would be a most interesting subject.)

Why is the under surface of the holly leaf of a lighter green than that of the upper surface? Why is the leaf glossy? (Pour some water on it and note the waterproof principle.)

Possibly some of my readers have never seen holly flowers, yet without flowers there can never, of course, be fruit. The flowers of holly are, however, very inconspicuous. This law must be brought before the mind on every conceivable occasion, as the whole principle of self - pollination, insect pollination, wind pollination, withering petals, and ripening ovaries is based on it.



Holly

1, Fruit. 2, Section of fruit. 3, Section of flower.

If readers observe the holly shrub in May or June they will see clusters of very small white blossoms growing at the base of the holly leaves. There will be light-brownish spikes to the flowers, which contain five petals. The remaining ovary forms into a small green berry after pollination has been effected. This berry, by the action of sugar and tannin inside it, changes to a bright-red colour about Christmas-time.

If the berry be closely examined, there will be seen five distinct markings—one in the centre and four outside. When the berry is dissected it will be seen that there are four bony little stones, each containing one seed, embedded in the flesh. Thus the berry is somewhat similar to other stone fruits, as there are the epicarp, the sarcocarp, and the endocarp (see p. 37). We may also call the holly berry a drupe (see p. 17).

The uses of the holly tree are various. Briefly stated, they are as follows:—

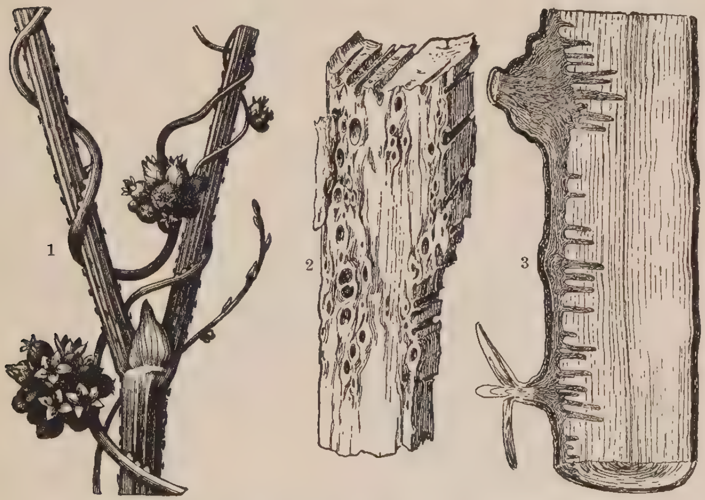
1. For decorative purposes.
2. Birdlime is prepared by boiling the inner bark and berries.
3. Form food for the winter migrants.
4. Wood sometimes used by cabinetmakers as an imitation of ebony, as it readily takes a black stain.
5. The berries are useful as an emetic.
6. In cases of emergency the leaves are cut up in the farmer's chaff-cutter and mixed with other food for the cattle.

## The Mistletoe and Parasitic Plants

This ancient Druidical plant is a good example of a parasitic plant. (Some writers call the mistletoe, broom-rape, dodder, &c., parasites. "Parasites" rather refers to animals which attach themselves to the bodies of other animals in order to sustain themselves, such as the fish lice, tapeworms, common lice, and so on.)

The formation and principles of a parasitic plant must be explained. Some of them are only *partially parasitic*. They derive part of their nourishment through their leaves, and thus endeavour to help themselves. Others are *completely parasitic*. They have no leaves, or, at most, extremely poor colourless specimens, incapable of producing plant food. They feed on the parent plant, or *host* as it is called, entirely. Examples of the partial and complete parasitic plants are the mistletoe and dodder respectively. The latter belongs to a group of slender, twining, leafless parasitic plants which may be seen winding around clover stems, vetches, furze, or heather, and which often kill the host by extracting all its nourishment. (Refer to the pages on "Bark" (see p. 84) for a description of the sapwood—the life of the tree.) The host of the mistletoe is the apple tree, poplar, or fir, all of which have comparatively soft barks. (In popular opinion the mistletoe is always associated with the oak, but it very rarely selects this tree as its host.)

The mistletoe is formed from seeds. The berries present a great attraction to the birds, which pick them off and probably carry them to a neighbouring tree. The pulp of the berries is very glutinous, and therefore when the bird, following its usual custom, taps its beak, which holds the berry, on the side of a branch, the gluey substance may adhere to the bark. In time the seed will become embedded in a small crack in the bark and will probably sprout. Tiny roots will pierce quite through the outer bark into the rich sapwood, on which they feed. Soon many other roots spread about, until there is a complete network firmly embedded in the sapwood. The rather curiously shaped long and narrow leaves appear, and in its earlier life they sustain the



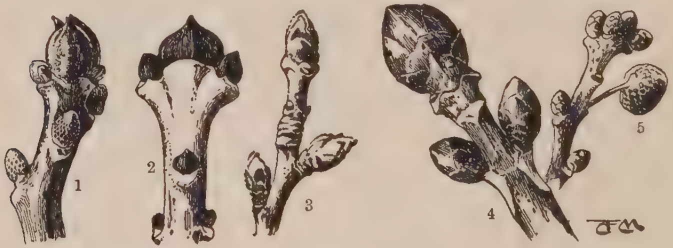
1, Dodder Parasitic on a Hop Stem. 2, A Piece of Wood perforated by the Sinkers of a Mistletoe. 3, Branch of Tree, with Parasitic Mistletoe, seen in section.

plant somewhat by making plant food with their chlorophyll grains.

Between the leaves, which always grow in pairs, are the little buds from which the berries will come. These berries are white, and contain many tiny veins. There is one seed in each berry embedded right in the centre. Much interesting lore is associated with the mistletoe. The plant is reared by gardeners dropping a seed into the bark of a suitable tree.

## Winter Buds

One of the so-called dead months provides a good opportunity to study the formation of buds. Nine children out of ten, unless they had previously been given a lesson on the subject, would say that buds are formed in spring. They watch them burst in spring, and therefore naturally conclude that they are formed then, as this is the only visual evidence they have had up till then.



**1, 2, Buds covered with Scales. 1, Walnut. 2, Ash.**

**3, Buds covered with Hairs. — Apple Tree.**

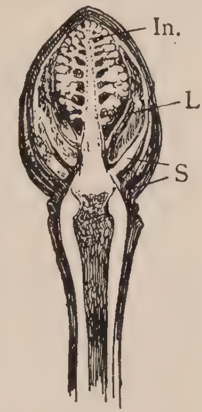
**4, Buds covered with Gum.—Horse-chestnut.**

**5, Smooth Buds.—Oak.**

I am not far wrong, either, in stating that nine adults out of ten, after being told that the above-mentioned belief was wrong, would conclude that buds were formed in winter or late autumn. This, too, is wrong. Buds are formed in summer. Examine a twig in summer, and this statement will be satisfactorily proved to you.

One of the most suitable buds for constant observation is that of the Horse-chestnut tree. The student will watch it slowly unfold, and can make periodical drawings of it, taking care to date each drawing. He should dissect it and notice:

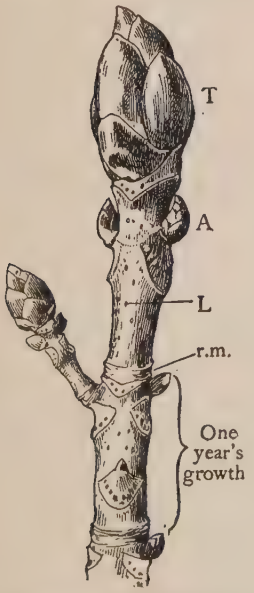
1. Outside leaves, arranged as scales.
2. Inner and very closely-packed leaves.
3. Short and thick stem.



Section of Horse-chestnut Bud

**In.**, Inflorescence. **L**, Foliage leaves. **S**, Scale leaves.

Observe what a marvel of compactness any bud is. It is protected from the frost by its thick brownish-coloured scales, and most of them are rendered waterproof by their oily nature. Some, too, as those of the willows, are covered with downy hairs, which act as warm blankets. Nature bestows infinite care on the bud, because it is the future life and hope of the plant. If plants were denuded of their leaves, which follow the buds, many of them would die.



Horse-chestnut Branch, showing **T**, large terminal bud. **A**, Small axillary bud. **r.m.**, Ring-like markings left by scale leaves. **L**, Lenticel.

When autumn comes, the tiny buds help to push off the stems of the old leaves from the twig. The rich plant-food has been withdrawn (see p. 34), and the buds nestle down in the axils of the old leaves until the warm spring causes them to shoot.

There are two classes of buds: (1) *Terminal Buds*, (2) *Axillary Buds.* The former are the larger, and they will continue the twig in an upward direction. The latter are formed in the angle at the base of the old leaves, and their stems will form new shoots.

In spring the surrounding scales of the bud fall off. They leave behind them a ring of scars. Thus, by noticing the distance between one ring of scars and the next, we can tell how much the twig has grown in a year. (The difference between leaf scars, which occur singly, and scale scars, which are in circles round the twig, should be noticed by direct observation.)

In speaking of winter buds, and trying to describe them, I am always reminded of that magnificent yet, withal, simple description given by John Ruskin, and it would not be out of place for my readers to learn it by heart:

> Every leaf has assuredly an infant bud to take care of, laid tenderly as in a cradle, just where the leaf-stalk forms a safe niche between it and the main stem.

Keen observation extended over a considerable length of time will show that all the buds do not turn into branches —for some of them are flower buds. You will not be able to conduct this extended observation under your own roof. But one of the chief benefits of real Nature Study is the cultivation of the systematic *habit* of observation at all times. It is of small value if you just compel yourself to observe certain specimens, &c., in a perfunctory sort of way. "The proof of the pudding is in the eating", and the test of a practical training in Nature Study lies in the systematic manner in which the students use their faculties of observation at all times.

Were all the buds to develop, the tree would have too many leaves. Thus, insufficient light would reach them. (Note the ways in which leaves seek this light—by their arrangement on the twig, and by their turning to the sun.) The tree would not provide sufficient food for all the baby buds to grow. Think what would happen to the mother cow if she had ten or a dozen sucking calves instead of one.)

*Why are branches forked?* This provides an interesting discussion. We have seen that the terminal bud is the largest and strongest, and that it continues the stem in an upward direction. Were the terminals never to die, the twigs would constantly grow in an upward direction.

If the forked twigs of many branches be carefully examined, there may be seen a circular scar and, at times, a rotting shoot or bud. Just underneath are two lateral semicircular scars from which the forked branches sprang. Thus a forked branch is, as a rule, produced through the death of the terminal bud. There is one other cause of a forked branch, and that is when the terminal bud is a flower bud. As soon as the flower has been fully developed and withers, the leaf-buds immediately underneath it shoot into side branches.

## The Woodpecker

One of the best birds to study during this month is the green woodpecker. It is quite a common bird, and by no means confines itself exclusively to the woods, as many people imagine. I could see one climbing the trunk of an old apple tree in my garden almost any morning I liked in the Christmas holiday, and doubtless many people can recall the sight of it and its curious little "tap-tap-tap".

With the exception of the kingfisher, it is perhaps the most beautiful of our British birds. It has green wings and breast, a red head with a purple streak on its throat, and a tail tinged with yellow. In size it is rather larger than a blackbird.

It may generally be seen tapping the bark of a decaying tree. Sound wood would be too tough for it to make much impression, and there would not be many ants and other insects to reward it for its hard work.

It has great assistance from its stiff and wiry tail in its climbing operations, as it bends it, fan-like, against the tree to steady itself. It is a remarkably agile bird, and runs about the upright trunk with the same apparent ease as its relatives on the ground.

It is intensely interesting to watch it in its boring operations. It finds a little pore extending into the sapwood, and instinct tells it that some insect is within. Suddenly out goes its long shining tongue like a dart, and the insect is held fast by the sticky saliva-like substance on the end of it. Could we examine the tongue, we should find spines at the tip curved backwards, thus forming an admirable spear.

Its beak is long, straight, and very strong, and it is able to tear away quite large pieces of bark with it.

When the woodpecker descends the tree—and it generally starts boring operations from the top—it always does so tail first. The tail acts both as a brake and a prop.

The nest is made in a hollow tree, or rather a hollow which has probably been made by the parent birds. Admittance is gained through a small hole just large enough for the bird's body to pass. There are from five to six whitish-coloured eggs, which are laid in early spring.

## The Ring-Dove

The ring-dove, or cushat as it is sometimes called, frequents the same places as the woodpecker. Nature lovers who live near wooded districts readily recognize it. It is beautifully shaped, and has a most gracefully curved neck of a bluish-grey colour. The prevailing colour is a steel grey, with a purple tinge on its breast, and grey underparts and thighs. It is called "ring"-dove because of a patch of white on either side of its neck forming a kind of collar. Its food is made up of grains, berries, small nuts, &c. Like the "clean" birds of old, it abhors flesh of any kind. It builds a clumsy nest of sticks and twigs carelessly interwoven.

*Nature Study for the Month:*

1. Christmas and countryside associations.
2. The House Cricket.
3. Holly.
4. Mistletoe.
5. Parasitic Plants.
6. Winter Buds.
7. The Woodpecker.
8. The Ring-dove.

*Flowers of the Month:* Christmas Rose, Ivy, Jasmine, and Hepatica.
*Fruits of the Month:* Ripened mistletoe and holly berries.

Bite, frost, bite!
You roll up away from the light
The blue wood-louse, and the plump dormouse,
And the bees are still'd, and the flies are kill'd,
And you bite far into the heart of the house,
But not into mine. —*Tennyson.*

The rigors of winter are generally with us now. We may have had summer lingering into autumn, and October weather for Christmas, or a "green" Christmas, as the villagers call it, but it is hardly possible that we shall escape the snow and keen frosts during this month. True, there are occasionally warm sunshiny days, when the butterfly is tempted out into the spring-like warmth, and is able to fly over flowerless fields and leafless woods in search of the nectar which is not. Woe betide him! In this climate of weather vagaries, when the thermometer is a splendid gymnast, the warm day is succeeded by a biting frost. Once having broken his winter sleep, he fidgets and fidgets in his retreat, and out he goes again, only to succumb to unfavourable conditions.

Yet during the latter part of the month we see a marvellous breaking forth into life, and Nature releasing, as it were, some of her pent-up energy. The snowdrop bursts into leaf, and the bulbs begin to break the soil above them. The branches of the elm seem to feel blindly at the sky, as if to discover whether spring has really arrived, and whether it be safe to unfold their buds.

But there are drawbacks to a mild winter! As the old saw says: "If the grass grows in Janiveer, it grows the worse for't all the year".

## Winter Flowers

"Surely," the reader may exclaim, "there are no winter wild flowers in this climate of ours!" And yet indeed there are, and very beautiful ones. True, they are not as plentiful as in the summer, but there are many specimens of an interesting nature to be found over the countryside. The shepherd's purse, winter aconite, groundsel, lesser celandine, together with the cultivated snowdrop and wallflower, may all be in bloom.

Seeds of Groundsel (wind-borne)

Though most of them are insignificant little things, all credit be to them for their pluck in bursting into blossom when everything else is wrapped in winter slumber.

The **Groundsel** is generally well known amongst those who keep cage-birds. Its flowers are tiny green tubes with yellow tips, to be shortly followed by the downy seeds borne in all directions by the strong winds. It is generally found near the tiny white chickweed.

**Shepherd's Purse** is an extremely popular flower with Nature lovers, especially young ones. The seed capsules may be compared with the purse, and the contained seeds are, of course, to a fanciful mind, the shepherd's money. These capsules grow on stalks up the stem of the flower—the shepherd's smock—just beneath the tiny white flowers. The plant has an abundant supply of fine fibrous roots, and this enables

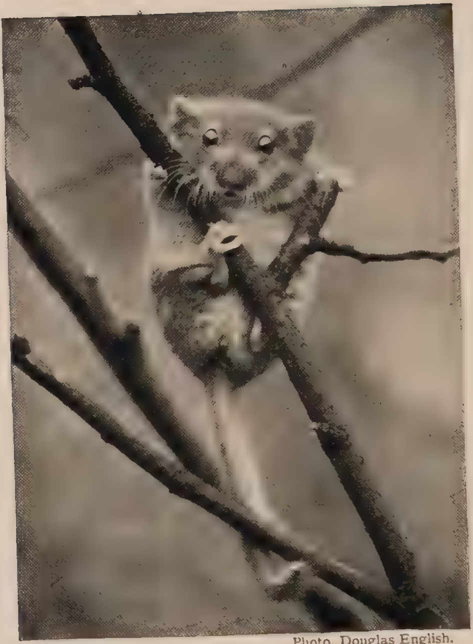


Photo. Douglas English.

DORMOUSE

*Page* 49

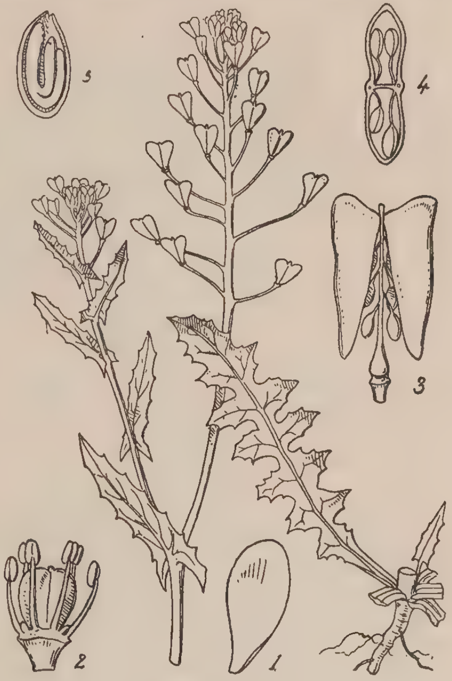
Photo. Douglas English.

SHREW

*Page* 49

it to show much energy in such unsuitable weather conditions.

Though only a common weed, which is often "born to blush unseen", yet it possesses an interesting history, and provides us with a good subject for study.



Shepherd's Purse

1, Petal. 2, Stamens and pistil. 3, Fruit. 4, Cross section of fruit. 5, Section of seed.

The **Snowdrop** and **Winter Aconite** generally have a race with each other as to which will bloom first. I have frequently seen snowdrops pushing up their leaves below the snow. Possibly owing to the blanket-like protection of the snow, they were enabled to do this sooner than otherwise. (Impress on your mind the great importance of snow as a protection to vegetation.) The appearance of the dainty snowdrop gives a far greater thrill than that of any other flower, for it is indeed the harbinger of spring. Tennyson says of it:

Many, many welcomes
February fair-maid,
Ever as of old time,
Solitary firstling,
Coming in the cold time,
Prophet of the gay time,
Prophet of the May time,
Prophet of the roses,
Many, many welcomes
February fair-maid.

Its fragrance quickly lures flying insects to its nectar, but woe be to the prowling insect which seeks its stores! The snowdrop has an extremely sharp curve at the top of its stalk. The crawling insect laboriously climbs the stem, and after mounting to the top of the flower, just where it sharply curves downwards, it falls from the slippery petals to the ground. Of course the flying insect can go straight into the cup, and by transferring the pollen dust from flower to flower, the snowdrop is successfully cross-pollinated.

Flower of Snowdrop

If the month be very mild, we may also see Wordsworth's favourite, the **Lesser Celandine**, in bloom. He thus speaks of it:

> Spreading out thy glossy breast
> Like a careless prodigal;
> Telling tales about the sun,
> When we've little warmth or none.

This flower belongs to the ranunculus family. Its eight petals are of a bright-gold colour. The leaves are large and heart-shaped, and the plant lives on the grassy slopes and pastures of the countryside. If we dig it up we should find many little tubers in which it commences to store its food immediately it has done blooming.

The explorer will feel a sympathy with these winter wildlings which does not exist with later plants. They have so much to battle against, and pluck always appeals to Britons. No floral faces are so cheering as theirs, as they stand in solitude out in the cold grey world, where they have broken the bonds of earth and "climbed to a soul".

Pine Leaves and Cones

## The Winter Woodlands

Outlined against the watery horizons in winter, the limbs, the arms, and the fingers of the trees are etched in grey and black. The pines and firs, together with a few churchyard yews, proud that they alone are green in the midst of such decaying desolation, whistle under the breeze. King Frost has gripped the gaunt forms of the deciduous trees with his icy clutch, and upon a throne of snow, and crowned with ice, his kingship is unrivalled.

## Pines and Firs

Norfolk is undoubtedly one of the best districts in England to study the pines and firs. For miles around the Brandon and Thetford districts these beautiful evergreens grow in serried masses. There is a delicious odour attached to a pine wood which, as the advertisement tells us, is "balm to the lungs and air passages". This arises from the turpentine and resin of the cones and twigs.

The general structure of the trees should be noted. They are easily distinguished by their tall and straight trunks and their needle-like leaves. Note how these narrow leaves prevent the snow staying on them, and there is a much smaller surface exposed to the frost.

You will soon discover the difference between the leaves of firs and pines by direct observation. The fir has flat leaves growing singly on the stem, while in the pines there are little bundles of two, three, or five rounded leaves on the branches.

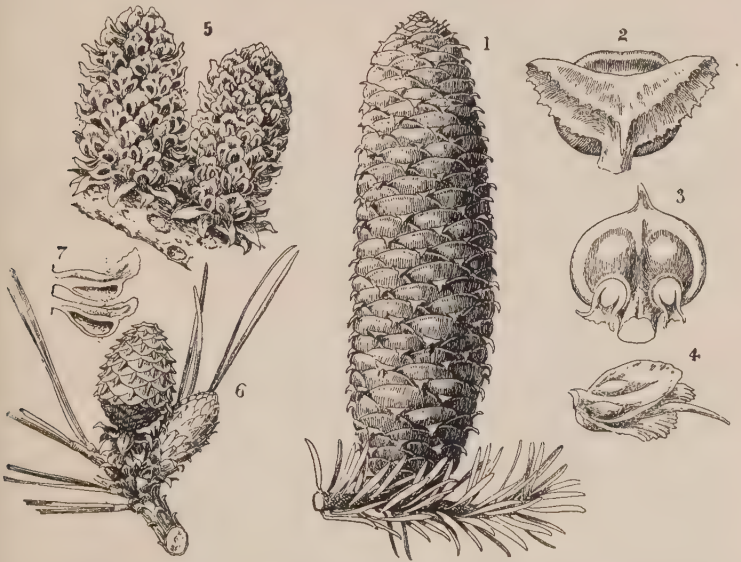
Why do so many of the lower branches of pines die off? Answer this by referring to the action of light on leaves. Much of the undergrowth usually found in a wood is almost absent in a pine wood. Why is this? The trees stand rather closely together, and grow to such a great height that vegetation underneath has a struggle to live without light and without moisture.

The leaves stay on the pines for about three years, after which they make way for the new ones. Under the trees they form a thick yellowish-brown carpet.

The children will be more attracted by the cones than by anything else. Because they produce cones we call them **Conifers**, that is, cone-bearing (Lat. *conus*, a cone; *fero*, to bear). The **cone** is the fruit of the tree, therefore there must have previously been a flower. This may be seen in June. There are two kinds of flowers on the same tree—male and female. The former are of a light-brown colour, and are composed of staminate leaves. They have air-floats attached to the pollen grains. (Try to realize the wisdom of providing these air-floats, which make the pollen grains buoyant. Were they not able to float in this way, they would seldom reach the female flower to fertilize it.) The female flower is of a reddish colour (refer to the small, reddish, female flower of the catkins). There are many flat and opened carpels which protect the enclosed ovaries.

The chief distinction between the cones of pines and firs is that those of the former have much coarser scales than the thin, razor-like scales of the latter.

If a cone which has fallen to the ground be examined, there will be found two tiny winged seeds beneath each scale. The scales will be distended, while those of the cones on the tree closely overlap each other. (Mark that if the scales were not distended when they had reached maturity, the seeds would not be able to escape.) They take about two years to ripen. In an average-sized cone there are generally from eighty to one hundred seeds.



1, Fir Cone (female). 2, Single Scale of Fir. 3, Scale of Scotch Pine, seen from above. 4, Scale of Larch. 5, Pollen-bearing Flowers of Mountain Pine. 6, Female Flowers of Mountain Pine. 7, Polliniferous Scales of Mountain Pine.

Should you be able to procure a few cone buds, you vould notice the thick coats of resin surrounding them. Note how this protects the bud from insects, cold, &c., and efer to the sticky nature of the horse-chestnut buds.

*The uses of the tree* are manifold. Their graceful symnetry and majestic height cause them to be in great demand or decorations. Their long, straight trunks are used for caffold poles, telegraph poles, ladders, masts, &c. Of course ou have heard of the pine timber ("yellow pine", "pitch pine", &c.) obtained from America and the Baltic lands, and can remember familiar articles of furniture made from it, such as desks, tables, cupboards, and so on. Thousands of pines are annually cut down in the lumbering camps of Canada. During many years now timber has been used for papermaking on a very large scale. Large districts in Newfoundland have been secured and paper-mills erected. Tens of thousands of pines are now beaten to paper pulp in these mills. (Give some scope for your imagination by realizing that it is quite possible that your newspapers were once part of these Canadian pine trees.)

As the wood contains so much resin, and owing to its soft texture as well, it is largely used for match-sticks. Besides the valuable resin, we obtain turpentine, tar, and pitch from its bark and sapwood, so that we may truly say that the pine and fir are two of our most useful trees.

## Evergreens

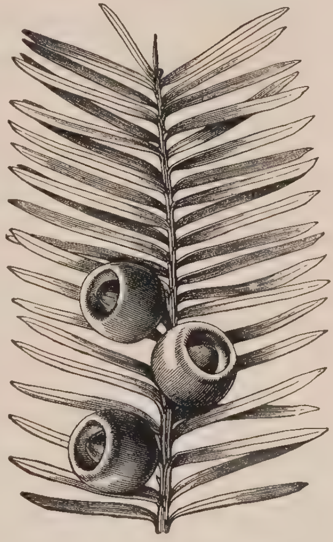
A study of evergreens would certainly be in season now. The great distinction between these and deciduous trees will of course be noted. Sprays of holly, laurel, yew, cedar, cypress, juniper, and fir should be before you. Do evergreens shed their leaves? The reader would reply in the negative in most cases. The reason we think they do not cast their leaves is because they do so in spring and summer, when there is so much verdant vegetation that this is not noticed.

Observe the extreme thickness and leathery texture of such leaves as the laurel. You will, of course, understand the necessity of this as a protection from cold, &c. The upper surfaces of these leaves are oily and glassy, thus making them waterproof.

The **Spurge Laurel** is one of the most ornamental of British evergreens. Many people do not use the prefix "spurge" in speaking of it. The true laurel, however, is not an English plant. It grows in Northern Africa and

Southern Europe, and the fruit makes a stimulating medicine. You do not need to be told of the wreath of bays crowning the victors of ancient Greece, and the word "laureate", as applied to our official poet, will recur to your mind.

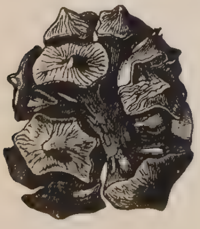
The common spurge laurel belongs to the Daphne class of shrubs. Its berries are very poisonous, and all children should be strongly warned not to pluck them. Its bark is an irritant to the stomachs of cattle. (Did the reader ever see cattle browsing on laurel leaves? If not, why?)



Branch of Yew, with ripe seeds

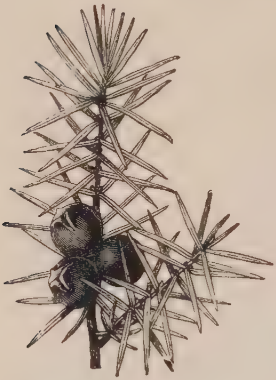
The **Yew** was formerly found in almost all village churchyards. (Think of the needs of the bow and arrow, and the benefit of planting the yew in such accessible positions.) It is an exceedingly handsome and majestic tree, with its outspreading branches and beautiful dark-green foliage. Again warn youngsters not to eat the rich red berries, as at least the seeds are poisonous.

The **Cypress**, though not so common as the yew, may be seen in many shrubberies and public gardens and parks, where it is planted for ornamental purposes. The leaves are very small, indeed, for such a large tree, and they have a rich green colour. The tree is generally oblong-shaped. Owing to its sombre colour, it is generally associated with mourning and funerals. From time immemorial cypress branches have strewed the way of the dead to the grave. The trunk yields valuable timber of a red colour, and possesses a highly pleasant scent.



Ripe Cone of the Cypress

The **Juniper** is more often seen as a shrub than as a tree in Britain. It has awl-shaped, prickly leaves. In mountainous districts this shrub is very prolific, although in the east and midlands it is rather rare. It produces rather large berries, growing in bunches near the junction of twig and stem. The berries are bluish-black, and yield a valuable oil which forms a medicine used in diseases of the kidney. Great use is also made of them by the Dutch in the preparation of gin.

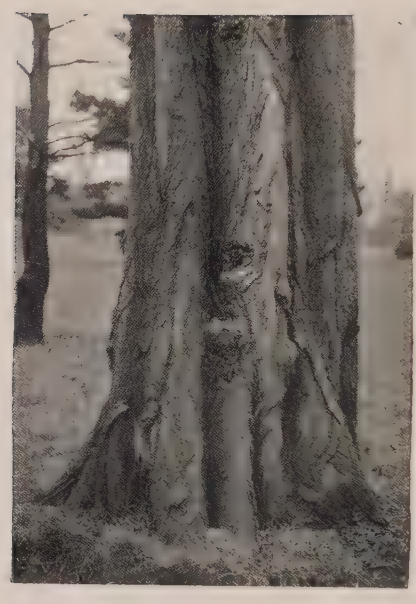


Branch of Juniper, showing berry-like cones

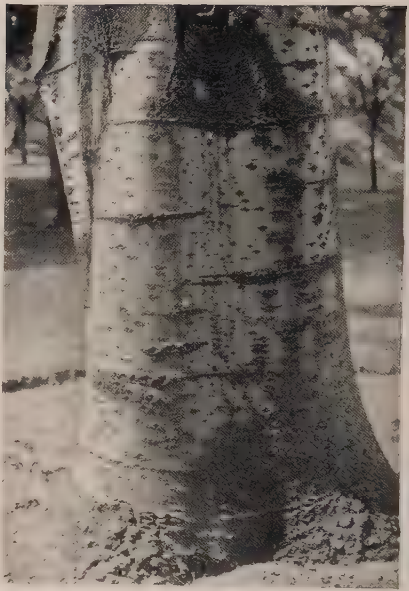
## How to Distinguish Deciduous Trees in Winter

The woods in winter—" Bare, ruined choirs where once the sweet birds sang"—will not seem dead and melancholy to the intelligent Nature lover. I have already pointed out that, stripped of their leaves, the trees may be more easily identified than in summer. There are many indications, besides the leaves, by which the different kinds of trees may be recognized. The winter rambler who observes and tries to identify the different varieties without the assistance of their foliage—which is, as a matter of fact, less characteristic than their bark and the growth of their branches and twigs—will learn to appreciate the rare beauty of their form and structure.

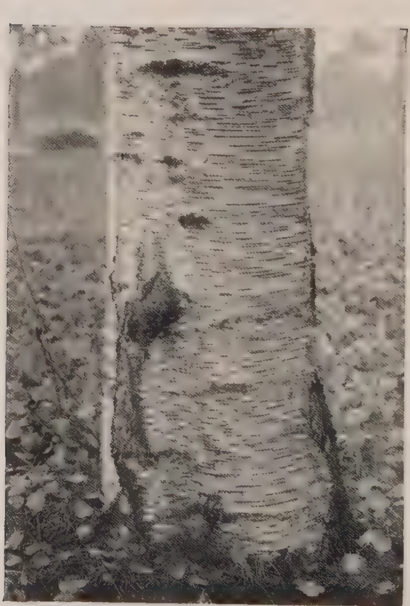
Nature students so unfortunately situated as to be unable to inspect living trees can nowadays obtain, from certain publishers, cards displaying specimens of the barks of the more common ones. These, of course, are a very poor substitute, but are better than nothing, and can be studied at leisure and used to refresh the memory.



LOMBARDY POPLAR



WHITE POPLAR: SMOOTH BARK OF YOUNG TREE



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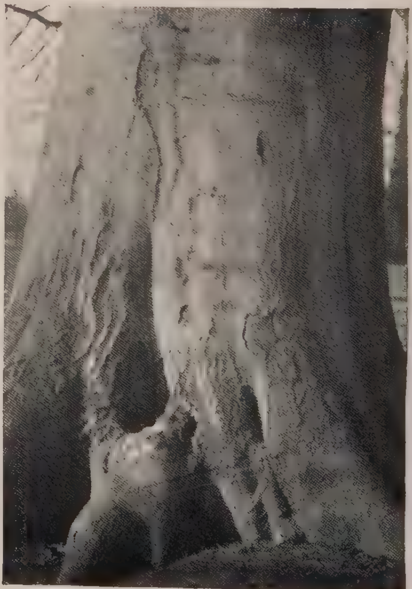
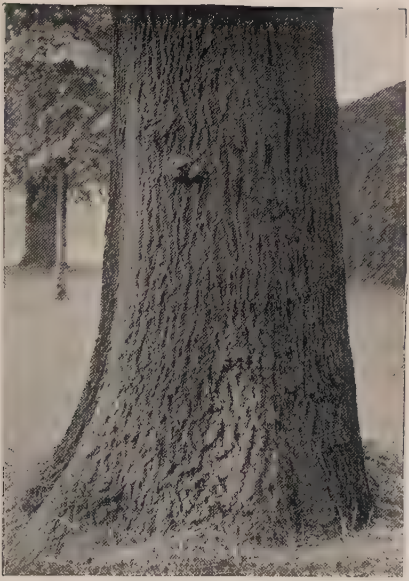
BIRCH



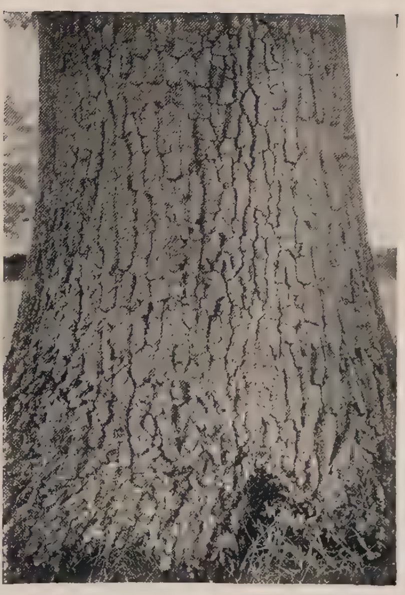
BEECH

HOW TO TELL TREES BY THEIR BARK—I

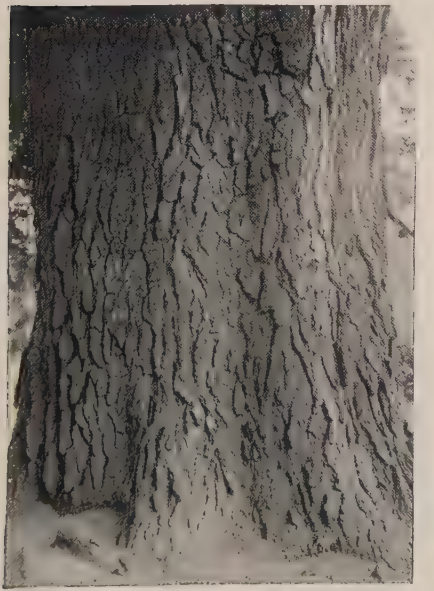
(Photographs by Henry Irving)



ASH



OAK



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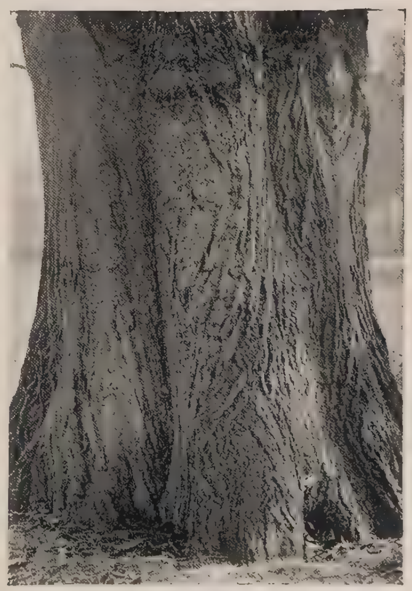
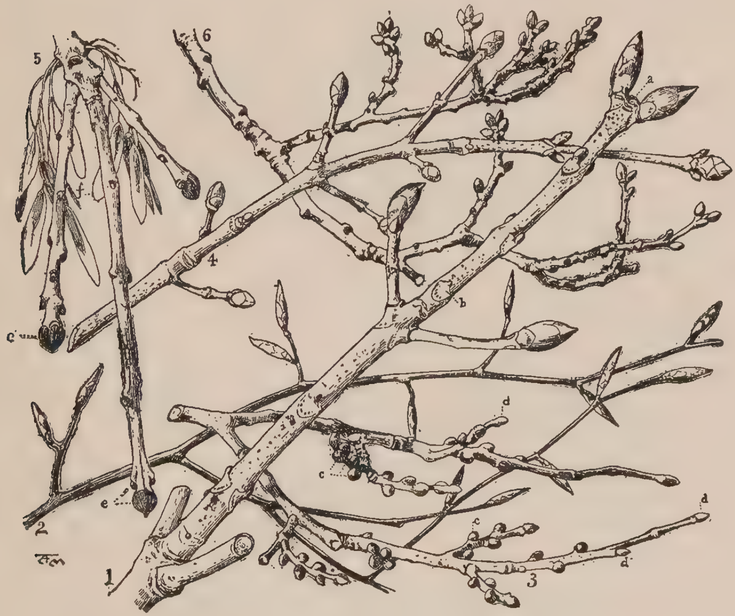


LIME

HOW TO TELL TREES BY THEIR BARK—II

(Photographs by Henry Irving)

The reader will recognize the cherry by its smooth bark of a reddish hue. The beech and sycamore are both smooth-barked, of a light-grey and reddish-grey respectively. Old sycamore trees may be distinguished by the scaly bark which comes from the trunk in flakes. The twigs of the beech are thin and long, and end with tapering, terminal buds, while those of the sycamore are short and thick, and possess rather broad or "fat" buds. The beautiful avenues of lime trees, planted in so many of our public thoroughfares, may easily be recognized. The twigs spread fan-like in all direc-



How to recognize the Trees in Winter by their Buds and Twigs.

1, Horse Chestnut (large buds, covered with gum. *a*, Scar left by last year's flower; *b*, scar left by fallen leaf). 2, Beech (long, pointed buds, twigs very thin and graceful, smooth and almost black). 3, Wych Elm (*c c*, round buds growing on the sides of twigs: these are the future blossoms. The leaf buds, *d d*, are smaller and more pointed). 4, Sycamore (sturdy green buds; bark and twigs, green grey). 5, Weeping Ash (buds, *e e*, dead black in hue. The seeds, *f*, if not blown away by high winds, hang on the tree all winter. They are forced off in spring by new growth). 6, Oak (note the upward turn of all oak twigs, and the many leaf-scars. Buds grow in irregular clusters, mostly at the extremities of twigs).

tions, and the trees are rather stunted in growth, as their branches are continually being cropped.

The weeping-willow, weeping-birch, and weeping-ash will all be distinguished by their prefix "weeping", and the trees may be distinguished one from another in the same way that the common varieties are.

Silver birches, or "ladies of the woods", are very common in gardens and woods. The bark glistens like silver, and is tinged with brown, and the twigs are very wiry. Try to break one—it is almost impossible. The bark of the ash has markings much like latticework; no other bark is like this, and it should be readily distinguished.

One kind of poplar will be easily recognized by its vertical branches and great height.

Such trees as the yew, cedar, spurge laurel, holly, pines, and firs may always be known in the winter on account of their evergreen nature.

There are other ways of distinguishing deciduous trees at this season, such as a study of their phyllotaxy or arrangement of their buds on the branches and twigs, but I have found the study of barks and general nature of the trees quite sufficient for a pleasant and interesting day's outing. If desired, drawings may be made of all the twigs examined, when the alternate, opposite, and spiral arrangements will be noted.

## The Robin

The redbreast will make a suitable and attractive subject this month. His beautiful breast, dear little ways, the superstitious customs and sympathetic actions attributed to him, all place him on a lofty pedestal in the bird world.

What a merry little bird he is! "When the robin sings, look out for winter," says the old saw. Alone in his glory as a songster he endears himself to the hearts of everyone.

He has won for himself a unique reputation as the friend of man, and no bird, not even the swallow or the nightingale, figures so often as the robin in literature and legend.

Thomson describes him very prettily in *The Seasons*, telling how, venturing into the house for crumbs, he

> Eyes all the smiling family askance,
> And pecks, and starts, and wonders where he is.

The redbreast did what he could for the Babes in the Wood—

> Their pretty lips with blackberries
> Were all besmeared and dyed;
> And when they saw the darksome night,
> They sate them down and cried.
> No burial this pretty pair
> Of any man receives
> Till robin redbreast, painfully,
> Did cover them with leaves.

Shakespeare, too, alludes to our little winter songster in *Cymbeline*:

> The ruddock would
> With charitable bill, (O bill, sore-shaming
> Those rich-left heirs that let their fathers lie
> Without a monument,) bring thee all this;
> Yea, and furr'd moss besides, when flowers are none,
> To winter-ground thy corse.

*Nature Study for the Month:*

1. The Groundsel.
2. The Shepherd's Purse.
3. Winter Aconite and Lesser Celandine.
4. Snowdrop and Snowflake.
5. Conifers.
6. Evergreens.
7. How to distinguish trees without their foliage.
8. The Robin.

*Flowers of the Month:* Winter Aconite, Snowdrop, Snowflake, Crocus, Dog's Mercury, Wych Hazel, Groundsel, Shepherd's Purse, Lesser Celandine, Spurge Laurel, and Stinking Hellebore.

And whoever wakes in England, sees, some morning unaware,
That the lowest boughs and the brushwood sheaf
Round the elm-tree bole are in tiny leaf,
While the chaffinch sings on the orchard bough
In England—now!—*R. Browning.*

We have now reached the last of the "dead" months (although up to the present we have found them by no means dead, so far as our nature-study interest is concerned), and during forward seasons we may see an active sprouting of bulbs and hardy wild flowers. "February fill-dyke" is a bad month for nature rambles. The long winter rains and snows have made the ground waterlogged, and, on heavy lands, walking along country lanes is most uncomfortable. Now is the time to make a closer study of bulbs (see p. 184 for complete description). Now, too, may be seen the crocus, winter iris, dog's mercury, spurge laurel, lesser celandine, and hairy violet in flower, all of which will make interesting studies. Gardeners are already commencing to trench the soil. (Knowledge of trenching and its great benefits to the land is most practical and interesting.) Among feathered songsters we hear the warble of the missel-thrush and the carol of the woodlark. Towards the end of the month some of the birds will mate, when the cock-birds will burst into song more energetically than ever in order to attract their wished-for wives.

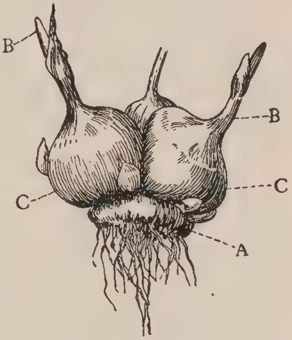
Light rimy frosts followed by bright sunshine bring the bees to the snowdrop and crocus, or cause them to swarm over the beautiful cushions of white arabis. The kexes make green cushions along the bank, and winter begins to war with summer, sometimes losing the battle for a day or two, but invariably taking its inevitable revenge. Woe betide the delicate leaf-buds which are suddenly tempted by the transitory burst of sunshine to unfold! Soon the black frost cuts them off, and their progress during the spring will be very tardy.

## The Crocus

There belongs to the very early spring flowers a particular fascination which is felt by all of us, and which has been beautifully expressed by the poets. The reader will remember and should read again that passage from *A Winter's Tale* in which Perdita, describing flowers, speaks of

"Daffodils
That come before the swallow dares, and take
The winds of March with beauty".

The daffodil is by no means the first-comer, for already in February a number of the dainty harbingers of spring—"delicate angelings", as they have been called—have made their appearance, emblematic of the triumph of hope.



Corm of Crocus

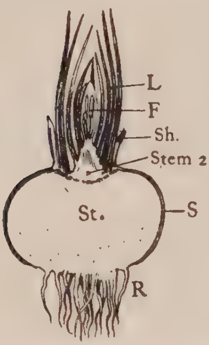
A, Old corm. B, Bud on C, new corm.

Any obtainable plants should be studied in detail.

The crocus is a corm and not a bulb as is popularly supposed.

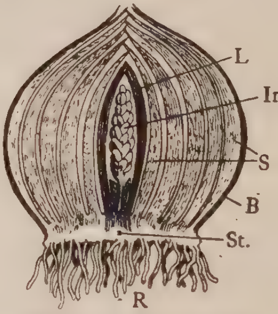
The former is really the dilated base of the stem, while the latter is a modified leaf-bud formed on the plant beneath the ground, sending fibrous roots from its base, and forming a stem from its centre. Both the corm and bulb should be dissected for comparison, when the thick stem of the former will be in contrast with the thick scaly leaves and much thinner stem of the latter.

Many people always think of bulbs and corms as roots, and this fallacy must be eradicated. On every occasion remember that they are *underground stems and buds*



Longitudinal Section of Corm of Crocus

L, Leaves. F, Flower. Sh., Sheathing leaves. St., Stem. S, Brown scale leaves. R, Roots. (Stem 2 will become next year's corm.)



Section of Bulb of Hyacinth

L, Foliage leaves. In., Inflorescence. S, Fleshy scale leaves. B, Brown scale leaves. St., Stem. R, Roots.

When they are dissected there will be seen innumerable coats closely overlapping. As we pull off the scales we shall find that they get thicker as we approach the centre, and that from the central one of all the flower stalk springs.

When the leaves and stems of bulbs and corms die off in April and May, there is a new central bud lying snugly within them ready for springing into activity the following year.

I am anxious to impress upon you the distinctions between underground leaves and those which we see. They may be tabulated as follows:—

| *Underground Leaves* | *Overground Leaves* |
|---|---|
| Grow round the central stem under the ground. | Grow from a shoot produced by the underground stem. |
| Because they live underground they are white. | Have a beautiful green colour caused by the action of the chlorophyll grains and the sunlight. |
| Are circular in shape. | Have flat blades. |
| Fat and juicy. | Thin and dry. |

Note carefully the necessity of these large underground storerooms to the life of the plant. The "frosty ways like iron" quite prevent the fibrous rootlets from obtaining much nourishment; but the great juicy underground leaves, or scales as we call them, make up the deficiency. (I have always found it helpful to call the bulb a "pantry" for the plant.) When the overground leaves died down in the previous spring, they sent all their nourishment down into the "pantry", where it was stored through the winter, thus causing the stem to shoot upwards long before other plants commenced to grow.

Readers will now be able to see how it is that bulbs and corms flower so much earlier than most flowers.

This may seem a digression from my subject, the crocus; but if you give the plant its correct description, it is quite necessary to distinguish between corms and bulbs, and this can only be done by pointing out their respective functions.

Readers will compare the crocus leaves with blades of grass, although they will find that the former are tougher. There is a light-coloured strip running along them, and the blade is rolled slightly backward on each side of the strip.

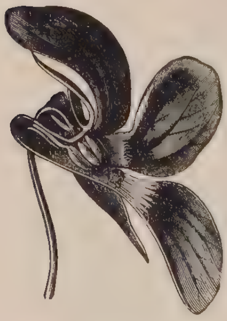
Section of Crocus Flower and Stem

The flower has a rather curious formation, and will make quite an interesting subject of study. The stigma will be seen to stand *higher* than the dust-boxes. Is this usual? No pollen can fall on the sticky stigma now; as in most flowers, therefore, the crocus cannot be self-pollinated. Then how does the pollen dust become transferred upwards to the stigma? Imagine a bee bursting into the calyx after nectar. It knocks the anthers, and a cloud of pollen dust falls on its back and legs. Having sucked one flower dry, as it imagines, it flies to another flower carrying its load of pollen dust. It brushes past the stigma of the second flower, and leaves on it some of the pollen dust from the first flower; thus the second flower is said to be *cross-pollinated.*

The long style upholding the stigma may be traced right down the whole length of the tube, and, as in all flowers, the stamens and petals, of course, will be counted.

## The Sweet Violet

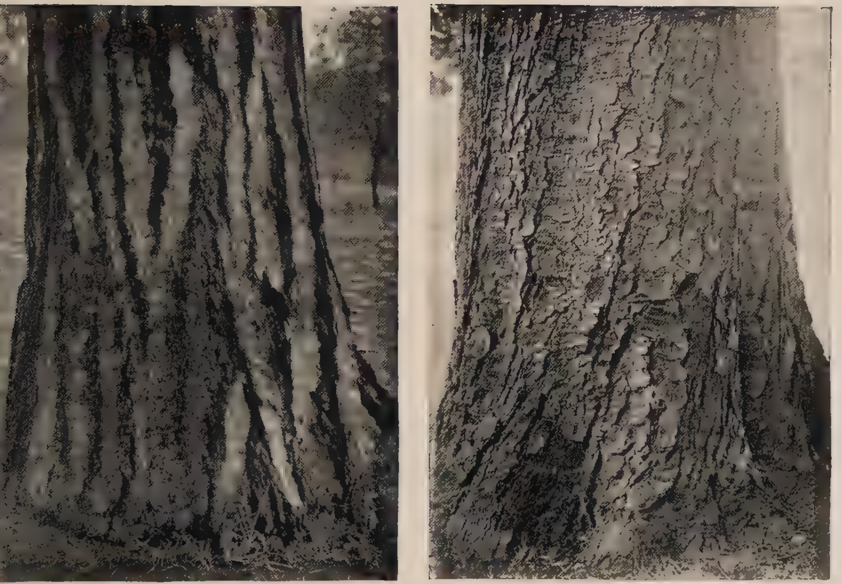
This beautiful little flower may be found blooming in sheltered nooks during February, and a twopenny bunch will provide enough specimens for any who cannot pick for themselves.



Flower of the Sweet Violet, part of the corolla cut away

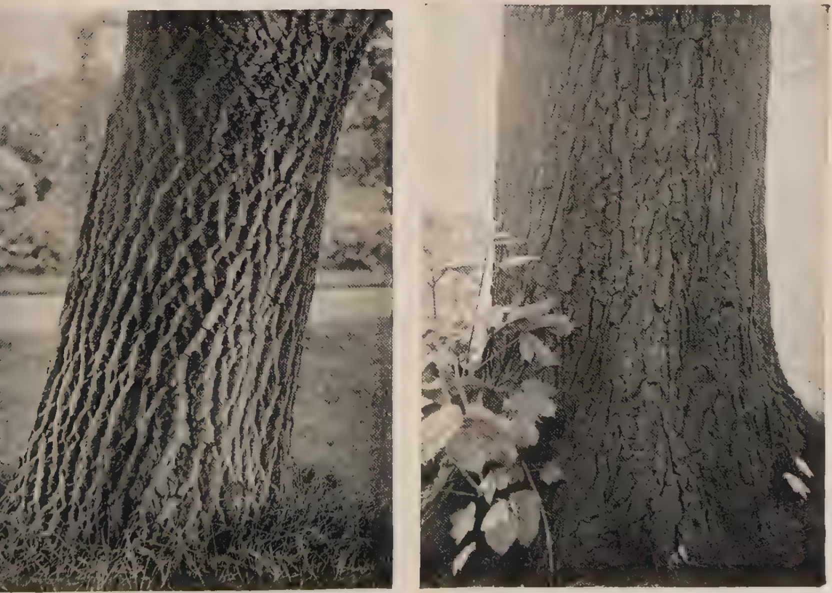
We always speak of the violet as a "modest" flower. It certainly is extremely unobtrusive, generally hiding itself among its rather large leaves, and drooping its head.

Readers will distinguish between dog-violets and sweet-scented ones. They will count the five petals arranged on the stem in the form of a star, and differing in size and shape. The two upper ones form a pair standing in an upright position; the two lateral ones are also a pair; but the lower and largest one is prolonged into a tube containing nectar. You must carefully search for the very fine streaks on the lower



LARCH

HORSE CHESTNUT



WALNUT

SYCAMORE

HOW TO TELL TREES BY THEIR BARK—III

(Photographs by Henry Irving)

petal. These are called *honey-guides,* because they guide the insects to the honey of the flowers. There are five green leaves forming the calyx. Two of these leaves are semi-detached, thus allowing the petals of the flower to pass between them. The other three leaves of the calyx are joined together at their bases. The colour of the flower, length of stem, colour of leaves, and shape of leaves, together with their veins, as well as a description of the rootlets, require no comment, as they may be readily observed by even the youngest child.

## Seedlings

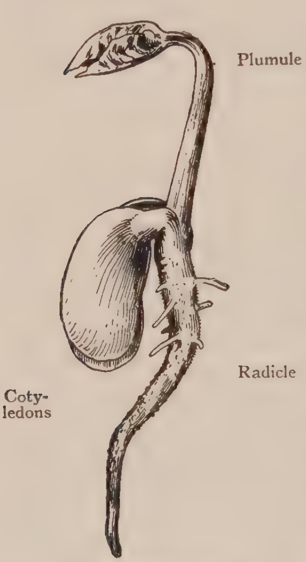
These can easily be propagated indoors by many methods, all more or less satisfactory. An assortment of boxes, saucers, or bowls full of growing things will give you a delight as real as that of a garden, and perhaps better opportunities than a garden for studying the development of plant life in detail. Until you have had the experience of waiting for the first signs of life, of seeing the first green shoots, and of watching the wonderful daily growth from seed to maturity, you cannot realize how much pleasure is to be derived from this simple hobby.

Children who take up the growing of plants in this way may have to be reminded of their responsibilities, however.

I once gave a school class of mine a drastic lesson on the neglect of flowers, which they never forgot. It was the monitor's duty to renew the water in the glass jars every day, and also to take away the dead flowers. There were also about a dozen pots of geraniums, fuchsias, &c., each in charge of a particular boy. Some of these boys got careless with regard to watering the plants, especially on Monday morning, when water was most needed. On two Mondays in succession a few of the boys neglected to come into the room for their plants before school, and they also forgot them at playtime. During the dinner-hour I wrote on a sheet of cartridge paper, in words large enough for the whole class to see, the following sentences:—

"We are only poor, dried-up, and withered old plants. We would have many pretty blooms if our owners did not neglect us so, but we cannot be expected to flower without water. We are trying to look as pretty as we can, but we feel weaker every day."

This placard was placed behind the flowers, and judge of the pupils' surprise when they marched into the school and read this novel notice. It had a far-reaching effect, and never more were the flowers forgotten.



Germinating Bean

One of the most successful ways in which I have grown seedlings was by using a common lamp chimney as a "pot". A sheet of blotting-paper was rolled around the inside of the chimney, and the beans, peas, and other seeds were pushed down between the glass and the blotting-paper. The base of the chimney was placed in a glass jar filled with water. By the capillary attraction of the blotting-paper the water rose up to the top of the glass, and the class could watch the seeds germinate by the "continued-observation" method. Drawings were made of the seedlings at regular intervals, each drawing being carefully dated. There are very many other ready means of germinating seeds, such as by wet flannel, sawdust, test tubes filled with water, damp moss; and so on.

The **Bean** is one of the best seeds by which to study germination. Suppose we have buried it in a pot of damp sawdust. After a week it might be "unearthed". The shell is soft, and it will easily peel off. There will be no harm in peeling it, as it is only the seed coat. You will notice the two halves of the bean closely pressed together and joined like a shell. The tiny bud can be seen by severing the two halves, and students will compare this to a baby stem.

Underneath the bud is another knob-like structure. This is the future root or *radicle.* After a few more days the radicle will be seen to lengthen in a downward direction, while the bud will grow upwards *in whatever position the bean was planted.* In fact, I have often purposely planted a bean with its radicle above the bud, so that the former would curve quite round until it could grow straight down. Between the bud and the radicle may be seen two tiny stalks, which attach the two halves of the bean. (Each half is called a cotyledon or seed-leaf. It is really the storehouse of the plant, just as the scales of the bulbs, or underground leaves, are the future life of the plant above-ground.) After a few more days the bean's rootlets will be developed. Notice the delicate root hairs, and the manner in which they cling to the sawdust. They have strong tapering ends, and can bore through the sawdust quite easily. The stem will have grown above the sawdust, and its cotyledons may be seen clinging to it as though the parent were loath to leave its offspring. Indeed, they will fold themselves downwards, and travel through the soil without dropping off, until they have seen their baby unarch itself safely above-ground.

By the "continued-observation" method the seedling can be watched for four or five weeks, and one drawing a week made of it to an exact scale.

By various experiments, as in keeping the plant in the dark for a few days and noting the increasing paleness of the leaves; by placing it near the window and watching how it turns its leaves to the light; by cutting off the roots of another plant (it is always best to have two or three plants, so that one may be sacrificed) and noting how long it is before it dies, much practical and interesting demonstration can take place. The evolution of leaf forms, phyllotaxy, and so on, may all be compared and contrasted with a variety of seedlings. Observers will also see that the stem grows much quicker in the upper intervals, and that the whole stem is proportionate in its rate of growth to its age. In the rootlets there is no apparent method of formation. They run here, there, and everywhere, evidently finding the lines of least resistance, and penetrating every particle of the mould.

## Bark of Trees

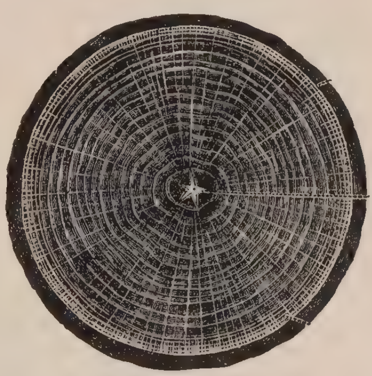
In an earlier chapter we have spoken of the barks of our most common British trees with regard to the help they give us in distinguishing the species to which the trees belong, or in naming the tree. It would be well to see how bark is formed, and how successive layers of wood cause the familiar "rings" in the woody trunk.

Readers should examine several specimens of bark, preferably obtained from trees in the locality. They will note the corky nature of the outer bark, they will see that it will not allow water to run through it, and they will also find out that it is very light and buoyant. All these results should be obtained by direct observation and experiment.

To prove the poor nature of the bark as a conductor of heat—a very necessary means whereby the heat of the tree is maintained—the common experiment of taking "comparative" temperatures can be performed. Heat a bar of iron or a long plumber's-spoon, and place on it pieces of iron, stone, and bark. After a little time place your fingers successively on each, when you will easily see that, though the iron and stone have become quite hot, the bark is comparatively cool. You will therefore deduce the fact that bark is a non-conductor of heat.

The bark of some living tree should be lightly scraped. Choose a young lime, beech, or birch. The under bark (or *bast*) is greenish and moist, while all nourishment has gone from the outside bark, which is dead. The gnarled and dead-looking outer bark of the oak may be similarly compared.

You will now be greatly interested in the way the tree trunk grows in thickness. The sap from the roots passes through the wood nearest to the bark, that is, between the outside covering of the tree and the hard, dead wood forming the centre of the trunk, or *heartwood* as it is called. This softer part of the wood that conducts the sap is called the *sapwood*. It goes through the branches and twigs to the leaves, where it becomes enriched by the chlorophyll grains, sugars, tannins, &c., of the leaves. It now returns to the trunk, passing downwards through the inner bark or bast. Between the bast and the sapwood there is a narrow ring of tissue called *cambium* or *growing tissue*. This produces new bast on the outside and new wood on the inside during the vegetative season, but does not grow during winter. Therefore, every year's growth is marked by a new ring in the wood. The corky bark is replaced in a similar way. The heartwood, sapwood, and rings of a log which has been cut through may be inspected, and the rings counted.



Trunk of Tree cut across, showing the Rings

All dwellers in the country can tell you that they have seen a hollow tree bursting forth into leaf every year. Were the tree to derive any nourishment from its heartwood, of course a hollow tree would die; but the fact that a hollow tree can grow, proves to us that the nutriment is contained in the rich sapwood.

Boys and girls should be strictly warned not to cut the bark of young trees, as it will probably kill them by checking the flow of food back into the stem, and causing them to "bleed". It is very harmful to the trees to cut initials in their bark.

The outside bark of old trees may be stripped off without injuring the tree. Remember the oak bark used in the tanneries, the bass of the lime, the cork of the cork oak.

Some trees yield an abundant supply of sap, and some of it can safely be drained off by making an incision in the sapwood. This white juicy sap is called the *latex*. Somewhat similar juice can be seen in the stem of the dandelion if it be squeezed downwards between the finger and thumb. The latex of such a tree as the rubber tree is obtained by placing a cup under the incision in the sapwood and letting the milky juice slowly ooze into the cup.

## The Crow

This large bird will be quite familiar to the reader, especially at this time of the year, when it is busily engaged in attracting its mate or building its rough and massive nest in the tree-top. Features to be noted when the crow is under consideration are its hard and large beak, which is very sharp, its nostrils at the back of the beak, its long wings, and its strong curved claws, used for tearing up the ground.

Carrion Crow

The clumsy nest is conspicuous. A bundle of sticks, lined with paper, hair, or straw, is lodged on the topmost boughs of a lofty elm. It is one of the earliest birds to build its nest, and frequently its young are hatched before the eggs of other birds are laid.

Rook

Readers must distinguish between the crow and the rook — many think they are the same. The crow is smaller than the rook; its beak has feathers round it, while the rook's beak is surrounded by a thick white skin; it eats carrion flesh, while the rook eats worms and insects, and will never touch putrid meat; it abhors company, and is called the "solitary" bird—the rooks like company, and are generally seen in flocks.

It is an amusing sight to watch a flock of rooks following a potato dibber down the field, for almost as fast as the man puts the potatoes in, the long beaks of the rooks pick them out.

About Whitsuntide sportsmen find their "sport" in rook-shooting. They go to the rookery and "bring down" dozens of young rooks that sit cawing on the tree tops. If the rooks are quite young they make very passable pies, but they require a long boiling or baking, as their flesh is tough and strong.

The **Carrion Crow** will eat dead rats, mice, lizards, worms, or offal of any kind. It robs nests of their eggs, especially the nests of the lapwing and lark, which are built on the ground. It has been known to attack young lambs, tearing huge pieces of flesh from their bodies and pecking out their eyes.

The **Jackdaw** should be mentioned in connection with this subject. Many children keep him as a pet, and his almost "human" call, "Jack, Jack, Jack", is familiar to us all. He is a nicely-shaped bird, rather smaller than the rook, having a much shorter bill and whitish eyes, and a grey head.

He builds in towers, spires, roofs of barns, tops of hollow trees, and other high but sheltered places, and the female bird lays about half a dozen large green eggs.

If he is kept as a pet he shows great thieving propensities, and frequently annexes and hides small bright objects—as thimbles, rings, spoons, scissors, &c.

***Nature Study for the Month:***

1. The Crocus.
2. Corms and Bulbs.
3. The Sweet Violet.
4. Seedlings.
5. Bark of trees.
6. The Crow, Rook, and Jackdaw.

*Flowers of the Month:* Laurustinus, Winter Honeysuckle, Crocus, Sweet Violet, Lesser Celandine, Shepherd's Purse, Lesser Periwinkle, and Wood Anemone.

Photo. Chas. Reid.

BLACKBIRDS AND NEST

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Photo. Chas. Reid.

THRUSH'S NEST

BIRDS AND THEIR NESTS—I

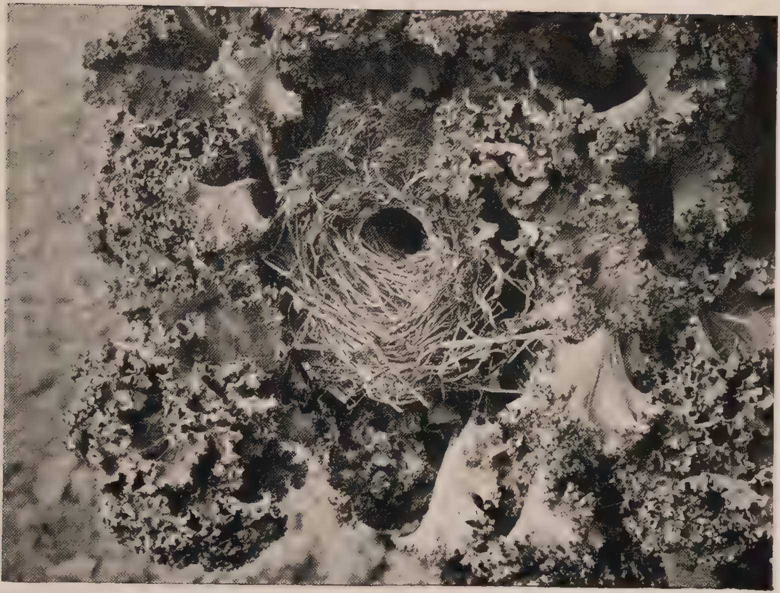

Photo. Chas. Reid.

WREN'S NEST

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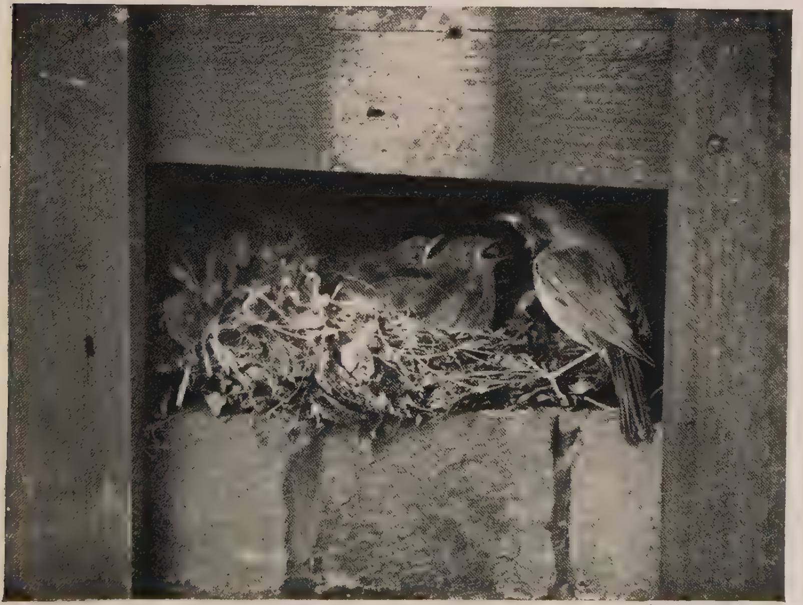

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Photo. Chas. Reid.

ROBINS AND NEST

BIRDS AND THEIR NESTS—II

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I heard a thousand blended notes,
While in a grove I sat reclined,
In that sweet mood when pleasant thoughts
Bring sad thoughts to the mind.
Through primrose tufts, in that green bower,
The periwinkle trailed its wreaths;
And 'tis my faith that every flower
Enjoys the air it breathes.
The birds around me hopped and played;
Their thoughts I cannot measure:—
But the least motion which they made,
It seemed a thrill of pleasure.

—Extract from Wordsworth's *Lines Written in Early Spring.*

Wordsworth, the great Lake and Nature poet, gives a magnificent pen-picture in this beautiful reverie. In his lovely home at Grasmere, "far from the madding crowd", the beautiful voices of the heralds of approaching spring would especially appeal to him. He seems to endow the flowers with feelings and actions almost akin to those of mankind. The same idea is expressed by a brother poet in the following extract:—

In all places then and in all seasons,
Flowers expand their light and soul-like wings;
Teaching us by most persuasive reasons
How akin they are to human things;
And with child-like credulous affection,
We behold their tender buds expand;
Emblems of our own great resurrection,
Emblems of the bright and better land.

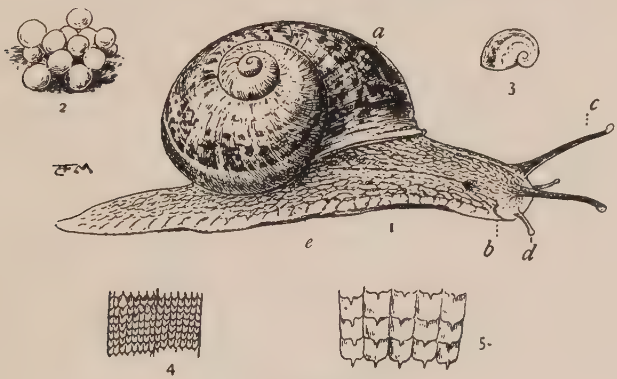
It is well for us, while studying the details of Nature's wonders, to refresh our minds now and then with the remembrance of such interpretations of the world about us. Our breadth of view and love of nature should increase with our knowledge, and the mind of the poet can sometimes suggest the beautiful meaning of some page in Nature's book which we are but learning to spell. Another beautiful thought is expressed in the following stanza:—

> Your voiceless lips, O flowers! are living preachers,
> Each cup a pulpit, and each leaf a book;
> Supplying to my fancy numerous teachers
> From lowliest nook.

There is much material to hand for our Nature Study during March. Hibernators are waking from their long winter sleep; sunny days entice the butterflies and moths to emerge from their shelters; the birds are busy mating and nesting; the buds are swelling, and, if the season be a mild one, they will be bursting towards the end of the month. Some of our winter migrants, after stripping the hedgerows and trees of all their berries, are returning to their northern homes, and our summer visitors will be taking their places, although there is not a large immigration until next month. The fruit trees are beginning to blossom, but the farmers on the Kentish and Devonshire orchards look upon a warm March with very mixed feelings. A few black May frosts will completely kill the young buds thus prematurely developed. The willow catkins will be swaying in the March breezes, and they never fail to provide an interesting subject for study. The bulbs are in their glory, and the primrose rears its pretty petals on the verdant banks of the woodlands. Snails have crawled out from their winter hiding-places, and their relatives, the destructive slugs, begin to worry the gardener. The earthworm is energetically trenching the soil, as indeed it has been doing all the winter.

# Snails and Slugs

As anyone who takes pride in a garden will sadly agree, there can be few subjects for natural history study more plentiful or more easily obtainable than the common snail. Whatever may be the gardener's opinion of them, snails are wonderful creatures, and a careful examination of specimens will compel you ever after to think of the whole family with new understanding and appreciation.



Garden Snail

1, Mature snail (*a*, shell; *b*, mouth; *c*, large tentacle (horn); *d*, small tentacle; *e*, foot). 2, Eggs. 3, Young snail. 4, Part of tongue, enlarged. 5, Teeth, further enlarged.

Contrast this curious family with vertebrates, fish, birds, &c. No legs! no backbone! no wings! no fins! The reader will begin to consider them in a class by themselves, and here the word **mollusc**, that is, soft-bodied creature, can be introduced.

Notice the curious skin. This is called the **mantle**, and is of considerable thickness, especially on the *under* part of the mollusc's body. This thick underskin is the **footsole**. Contrast this with a real foot.

A splendid experiment is to make the snail crawl on a piece of clear glass, and watch its movements from the *under* side of the glass. It moves along by a wave-like movement, the "wave" commencing at the tail and passing along the entire length of the creature's body. Compare this with a wave out at sea coming towards shore.

The reader will notice there are two pairs of horns, the top pair of which are much the longer. See how the snail withdraws its horns when they are touched! It rolls them inwards much like an inverted glove finger.

At the ends of the long horns are the snail's eyes. These are not fixed, but can move up and down slightly. Note the benefit of this.

Just as all the mollusc's thick underskin is called a "foot", so is all the horny plate in the upper lip called a "tooth". This plate is ribbed. Perhaps the reader could examine a pulpy fruit which has been gnawed at by the snail, so that the grooves on the pulp could be seen.

The mollusc's tongue is in a very rudimentary state. It is really more of a rasp. One could not see the very minute teeth without the aid of a microscope. It is computed that there are over ten thousand of these teeth, each perfectly formed.

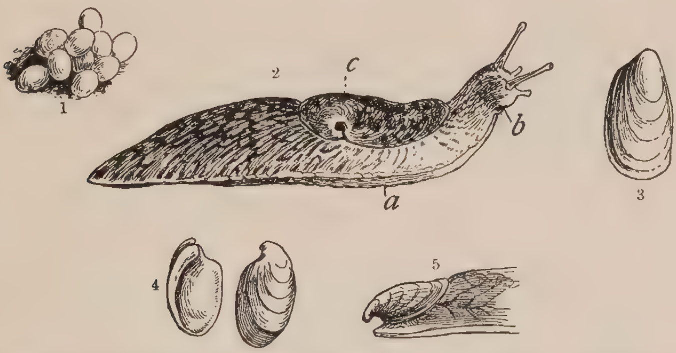
You are sure to be deeply interested in the wonderful "house". This "house" is made by the snail from a chalky fluid secreted by glands in the mantle. To stimulate these secretory glands much vegetable food is eaten, the lime of which is used to make the shell.

Let the reader break one or two shells. You will notice that the inside is white, while the outside has coloured ribs, &c. The central glands secrete the fluid to make the inner lining, while the glands on the edge of the mantle are used for colouring matter.

The Natural History Instructor in a school I once attended performed an interesting experiment with the snail. A portion of its house was broken in such a way that the mollusc's body was uninjured. After a few days the broken portion was splendidly patched, but the colouring of the shell was broken.

To study the eggs of the mollusc, one again needs the microscope, as they are no larger than a pin's head. These eggs may be dug up from just under the surface of the ground in clusters of from thirty to forty. They are round, and of the colour of frosted glass.

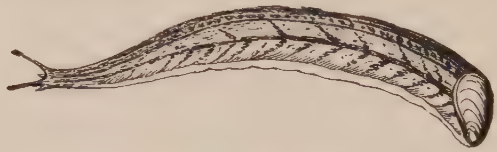
When you capture your snails for study under the microscope, be careful to note upon what plants they were finding a living, and you will understand why the gardener kills them when the opportunity offers. His wisest plan is, of course, to destroy the eggs, if he has a chance of doing so. Snails have enemies more persistent than even the gardener. These are to be found amongst the birds, the thrush in particular having a ravenous appetite where snails are concerned. Do not forget that the snail is amongst the creatures that indulge in a winter sleep. (See November: "Hibernating Animals".)



1, Eggs of Great Grey Slug. 2, Great Grey Slug (*a*, foot; *b*, mouth; *c*, breathing hole). 3, Shell of Great Grey Slug. 4, Shells of Testacella. 5, Tail end of Testacella, showing shell.

The **Slug** may be treated in much the same way as the snail. It breathes by a lung in the same manner as the snail. The reader would never think that slugs have shells. These shells are generally concealed under the mantle. What is the use of them there? They form a sheath of armour which protects the mollusc's body. Note that molluscs have no protecting ribs as vertebrates have.

The **Great Grey** and **Black Slugs** are the largest British specimens, although the **Testacella,** which is a great pest in the garden that contains dahlias, is more frequently sought for. Why do gardeners search for slugs after a shower of rain, or in the evening when the dew is on the ground?

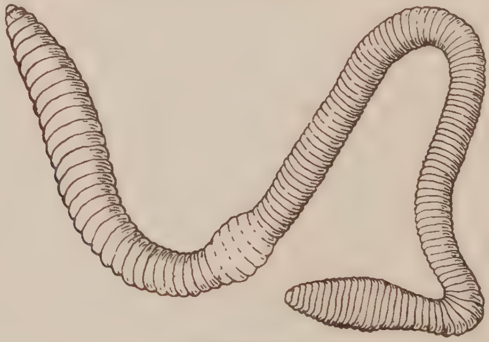


Ear-shelled Slug (*Testacella*)

From this you will deduce that the creatures prefer moisture. Indeed, if they were kept in a perfectly dry place they would die. How do they escape from the heat of the noonday sun? —By burrowing into the earth. The little testacella attacks small worms and frequently devours their eggs.

## The Earthworm

The **Common Earthworm** will make an interesting subject this month. Why is its body cylindrical? Refer to the pointed nose of the mole and other burrowing animals.



Earthworm

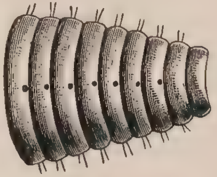
Examined microscopically, one could detect the numerous bristles on the under part of its body. It could also be seen that the worm has a segmented body, each segment containing four pairs of bristles, which point in a backward direction.

In all there are over 150 of these segments. Remember the term **Annelida**, that is, "ringed animals". Refer to the lobworm and leech as other ring-formed animals.

Of what use are the bristles? The reader will compare them with legs. As the worm glides through the burrow, these bristles help it to move very fast.

The worm has no eyes. You will, of course, realize that they would be of little use if they did exist, as the creature spends most of its time underground; or, when it comes above-ground, it generally does so at night.

The worm's mouth will be difficult to discover, as it is hidden under the overlapping segment. The mouth is armed with horny jaws, and there is a proboscis which protrudes slightly. The slimy body will call for observation. Mark how this slime greases the burrow, thus allowing the creature to slip through it smoothly. Where does the worm go in very dry weather? Why does it bore so deeply into the ground? Where would the boys go to find worms when they wanted them for fish bait? Why does it frequent refuse heaps, &c.?



Section of Body of Earthworm, showing Bristles

The worm lays eggs deep down in the earth, much deeper than the eggs of the snail or slug are laid. These eggs are placed in a cocoon about two inches long. Compare the worm's method of locomotion with that of the snake on the ground. (You could not compare this nearly so well if the snake were in the grass, as it glides remarkably quickly there.) The same wriggling movement is manifest in both, but the snake is helped by its scales, whereas the worm relies on its bristles.

The reader will have noticed *worm casts* on the grass in the early morning. These casts are formed of earth which has passed completely through the worm's body. Note how the worm, therefore, does good by bringing up the richer soil from below. Compare this with "trenching" the garden.

Darwin estimated that there are 53,000 worms to the acre, and that these creatures raise ten tons of soil to the surface annually. The burrows, too, act as ventilators to the roots of plants. The casts of the lug or lobworm are to be found on the seashore.

Thus it will be seen that this lowly creature may be considered by us in such a way that its wonderful usefulness may be emphasized. It is needless for me to point out that, wherever possible, this should be done. The manifold potentialities of Nature, in nearly every case, allow of this point of view being taken, and, thanks largely to the rapid growth of Nature Study during recent years, the old-time semi-barbarous behaviour towards animals is rapidly disappearing.

## Birds and their Nests

March is a month very rich in lore for the nature student, for not only are the flowers beginning to show in greater numbers, and plants of many kinds to break into leaf, but the nesting season of the birds has commenced.

There was a time when those who took an interest in birds and their habits developed it by making collections of eggs, and even of entire nests, but the general feeling now is against the prosecution of Nature Study at the expense of the living things with which it deals. It is quite unnecessary to rob nests in order to acquire a knowledge of the various eggs, and even the youngest among us will soon learn to take far more pleasure in knowledge gained without the infliction of suffering, than in collections of trophies.

We may take the **Blackbird** and **Thrush** together in giving a description of their nests. From the outside they are not at all easy to distinguish. Both birds build in a low bushy hedge, generally overhanging a ditch. The framework of the nests is made of dry grass, straw, and perhaps some very fine twigs. When you place your hand inside you will soon find a great

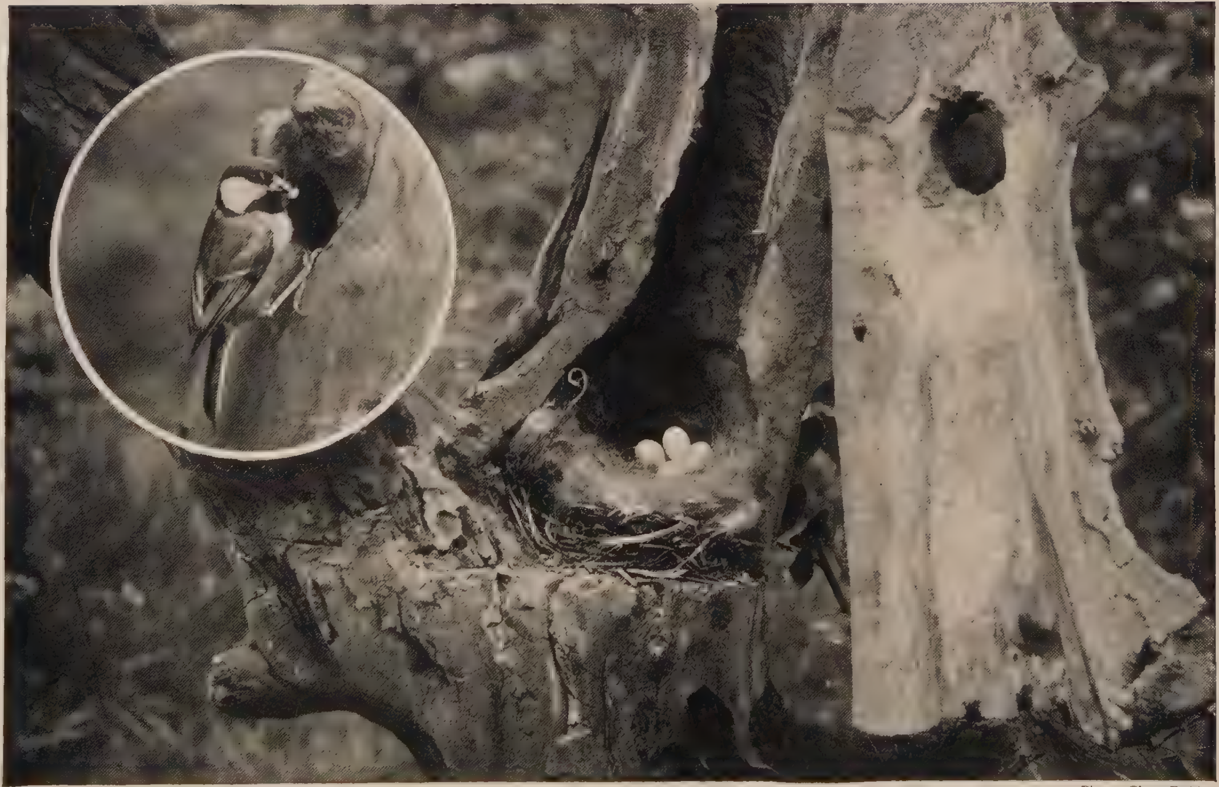


Photo. Chas. Reid.

BIRDS AND THEIR NESTS—III: GREAT TIT (in inset) AND NEST difference, for the blackbird's nest is lined with dry grass, while that of the thrush has an extremely neat mud plaster. The bird shows infinite care in kneading the mud pellets with its beak and feet into so even and smooth a surface.

The **Jenny Wren's nest** is a model of symmetry and comfort. For so small a bird the nest is rather imposing. This nest is very remarkable, as it possesses a roof. Thus when viewed from the back it looks like a ball, and it is about the same size as a tennis ball. It is made of moss and dry leaves, and the entrance, which is very small, is from the side. Among bird architects the little "jenny" would take a prominent place.

Of the strange places in which **Robins** build there is no end. Glue pots, salmon tins, old boots, in fact almost any sheltered place will answer their purpose. These birds build very early. Unlike the returning migrants, they care not what the weather be. When the season comes round they mate, whether it be unseasonable weather or not. The nest always has a covering to it. Sometimes a fall of snow takes place before the eggs are hatched, and thus the roof is very necessary. For many years a robin brought off its brood in an old and disused glue pot hanging on my garden wall.

To see the **Tit's nest,** one must search in the elm or willow trees. This is a real work of art. It is composed of moss and wool, which it obtains from the sheepfold. It may be seen swaying about in the wind firmly woven to the supporting branch. I have never found a really neater nest than that of the tit. It is rather strange that, as a rule, the smaller the bird the neater is the nest. Other remarkably pretty nests are those of the finches, more especially the nest of the goldfinch, to be found on the apple or hawthorn boughs.

Jenny wren's relation, **the Gold-crest Wren,** generally selects the yew in which to build. If there be no yews in the locality, then the cedar or fir trees will do quite as well. This nest, too, hangs on a branch, and the bird must needs enter from the side.

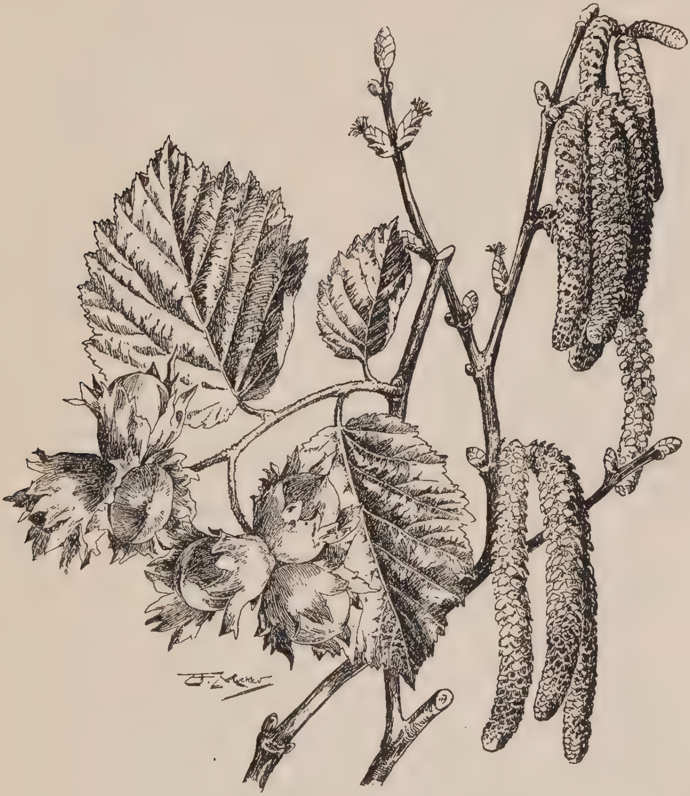
The piping **Bullfinch** does not make a nest in keeping with its beautiful plumage. A few dried weeds or pieces of coarse grass, built saucer-shaped, with no apparent care, answers this bird's purpose. It is the most untidy nest of which we have yet spoken.

But, now we are on the subject of untidiness, we must surely include the **Sparrow** as the king of birds in this respect. A favourite place is under the eaves of a thatched barn. In the town, they select the gutters or any pipe leading out of the gutter. From an energetic point of view, they are to be highly commended, for they provide enough material to build a dozen nests. Straw, wool, feathers, and grass are stuffed indiscriminately into the hole until it is quite blocked up, and they just scoop out a place in this bundle large enough for them to sit on the eggs. They take no pains to conceal their nests, and it is no uncommon sight to see a bunch of straw sticking out from the eaves where they have nested.

The **Swallow's nest**, on the other hand, is a model of neatness. For days and days these hardworking little birds fly to and from the brook bringing pellets of mud, which they plaster down with their beaks and feet. They first form a firm foundation on the side of the wall and the eaves, and when this foundation is quite dry they rapidly complete the outside covering, lining it with feathers and wool.

Boys will be quite familiar with the nest of the **Moor-hen.** Doubtless many of them have gone home wet-footed through attempting to reach one. The bird chooses a number of twigs and rushes, and does not adopt any system in using these materials. It simply swims up with them and drops them down among the reeds, one above another, until it thinks there are sufficient sticks to prevent the eggs slipping through into the water.

**Jackdaws** frequently choose chimneys in which to place their rather slovenly nests, but more frequently they build in hollow elms or oaks. Like the moor-hen, they build with sticks, and the appearance of the nest when completed is most untidy. But the very worst bird in this respect is the



Hazel (see next page)

The twig on the right shows flowers and catkins; the one on the left is bearing leaves and nuts

**Starling**. It builds in similar places to the sparrow, but as it is a larger bird, it uses far more rubbish. Small wonder is it that many gardeners bring these birds down with a gun during nesting-time,

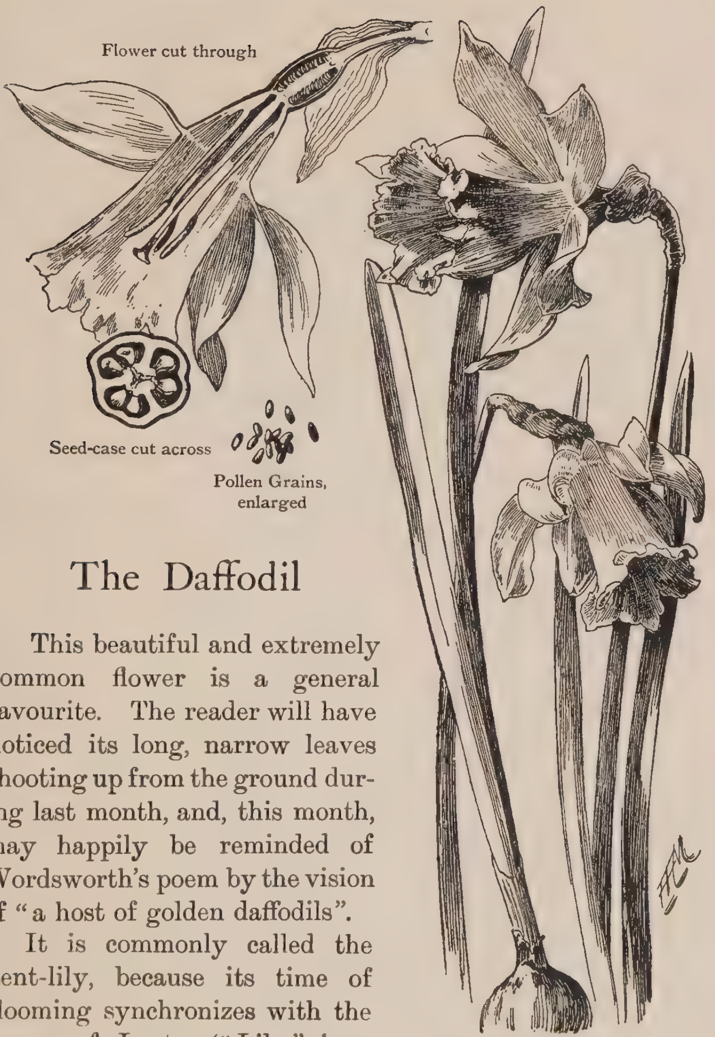
## Catkins

We should waste the opportunities offered by this month of March if we did not devote some attention to the catkins, which are now a great feature of the woods and hedges. Children call catkins "lambs' tails", and love to gather them when, under the genial influence of springtime, they really are soft and fleecy.

The catkins may be seen swaying about on the bare hazels all the winter, but they will be dull-looking, shrivelled objects. Little by little they form into pretty pendulous tassels, and make a nice hedge decoration. If they are carefully examined, the pollen-bags may be found underlying the tiny grey scales.

Near the tips of the branches of the hazels may be seen tiny flowers, each flower being composed of two pretty red knobs. These are the female flowers, and several of them are joined together in one calyx.

The March winds cause the long male catkins to release their pollen, and some of it adheres to the knobs of the female flowers. This impregnates them, or pollinates them as we say. Continued observation will show them to swell gradually into nuts. Soon the destructive nut-weevils appear and lay their eggs in them (see pp. 28 and 29). Many of them are eaten by that ravenous little bird, the nuthatch, and the squirrel picks many hundreds of them when they have ripened. By doing so, the squirrel is an unconscious tree-planter. He gathers his hoards of nuts, and is so busy in the work that he stores them in various places. He is a forgetful little fellow, and it is quite likely that he will not remember where he has placed some of his stores. If this be the case, then the nuts will find a home in the rich, loamy soil of the woodlands, and in the spring they will probably germinate. (Other interesting catkin studies may be obtained from the willow and birch families.)



Daffodils

## The Daffodil

This beautiful and extremely common flower is a general favourite. The reader will have noticed its long, narrow leaves shooting up from the ground during last month, and, this month, may happily be reminded of Wordsworth's poem by the vision of "a host of golden daffodils".

It is commonly called the Lent-lily, because its time of blooming synchronizes with the season of Lent. ("Lily" is a misnomer, because the Lily family is quite distinct.) The leaves come straight from the ground. (Note the difference between this and most other flowers.) The veins are straight and parallel, and not latticed as in many flowers.

The flower hangs on a very long stalk. It is especially noticeable for its deep yellow tube. There are six petals and six stamens. The position of the pistil is remarkable. It is placed *outside* the flower, and can be easily seen by the swollen stalk just under the base of the crown. (Compare the position of this pistil with numerous other flowers.) (The bulb from which the flower springs is fully described on p. 78.)

The **Snowdrop** and **Snowflake** are members of the Daffodil family.

Mention should be made of the huge daffodil farms in the Scilly and Channel Islands. Why are these farms situated in these southern districts? Bear in mind that the flower has rapidly risen in popularity for house decoration, and that the cultivation of daffodils is a profitable industry.

Wordsworth's poem above referred to, "I wandered lonely as a cloud", should be read in conjunction with this chapter for the sake of its lovely picture of a field of golden daffodils gently swaying in the breeze. Herrick's lament for the departure of the daffodil is also a most memorable little poem.

*Nature Study for the Month:*

1. Snails and Slugs.
2. The Earthworm.
3. Birds and their nests.
4. Birds' eggs.
5. Catkins.
6. The Daffodil.
7. The Narcissus.

*Flowers of the Month:* Mezereon, Winter Heliotrope, Marsh Marigold, Coltsfoot, Wood Anemone, and Stitchwort.

> The young lambs are bleating in the meadows;
> The young birds are chirping in the nest;
> The young fawns are playing with the shadows;
> The young flowers are blowing toward the west.
>
> —*Mrs. Browning.*

What a splendid month is this from a nature-study point of view! We have such a huge varied collection of most interesting and suitable subjects from which to select. There are the winter migrants leaving our shores, and we feel that we must speed them and follow them to their northern regions; there are, too, the summer migrants in full flight over the Channel, busily preparing their nesting places in the southern counties. The cuckoo's voice is sounding among the opening buds, and the swallow is skimming the fields and paddling in the mud to find material for its nest. The busy hum of insects already fills the air. Spring is quite manifest among the hedgerows. The wide leaves of the parson-in-the-pulpit have unfolded, and primroses line the mossy banks.

Nature is making wonderful changes in the woodlands, which, by the way, we have not visited for some time. When we last traversed the pathless woods there was a deep silence, only broken by the pheasant's cry or the robin's song. This month sees the woodpecker more energetic than ever—

all is bustle and activity. The hedgehog has emerged from the bracken, and the grass-snake and viper have uncoiled themselves from their retreat in the hollow tree. Cowslips, buttercups, and daisies bespangle the meadows, and the common pea in the fields of Essex and Kent is already bursting into bloom. The blackthorn covers the hedge with a snow-white mantle. Great activity is apparent in the pond, and already large masses of black-speckled frog's "jelly" float on the surface. This is the month to prepare your aquarium, and a visit to the pond about Easter-time—if the weather be warm and Easter late—will provide you with many interesting captures. (For construction of the aquarium, see p. 181.)

Vernation and venation may alike be studied, and examples of pollination are plentiful.

With all this wealth of matter we hardly know where to commence, but we cannot do better than start with

## The Primrose

This pretty and common little flower may be found on grassy banks growing in large clusters, which completely carpet the bank with a rich yellow colour. It is a perennial, and thus it may be looked for in the same place year after year. The leaves are very broad and thick, and oval in shape, and there is a strongly marked mid-rib from which clear lateral veins branch.

Trace the flower stalks downwards to see how they arise from the heart of the radical leaves, and also note the fine hairs on the stalks. You will note the use of these hairs in protecting the flower from the ravages of undesirable insects, and in keeping the stalks moist.

The flowers of the primrose provide a most interesting study, for they are different from nearly all others.

There are two quite distinct types of flowers. To the casual observer both flowers are alike, but if they be carefully dissected the distinction is most marked. These differ-

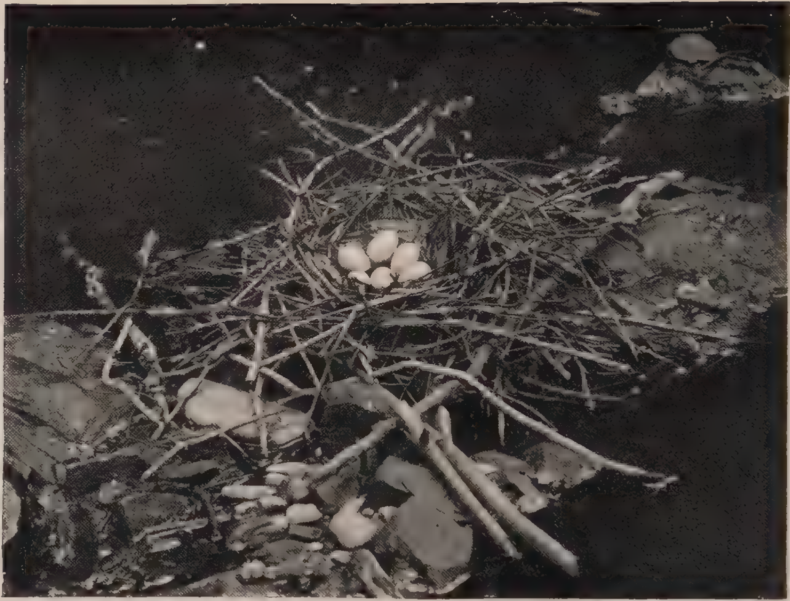


Photo. Chas. Reid.

MOOR HEN'S NEST

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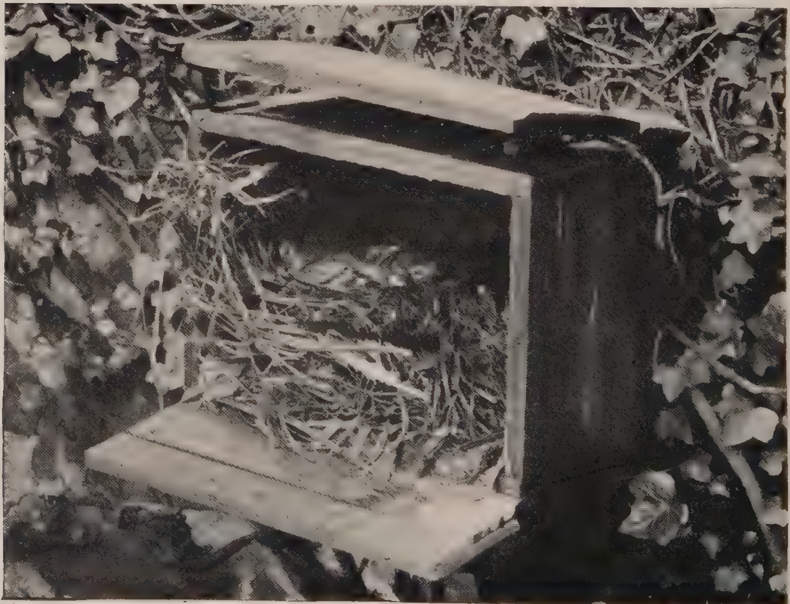

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Photo. Chas. Reid.

STARLING'S NEST

BIRDS AND THEIR NESTS—IV

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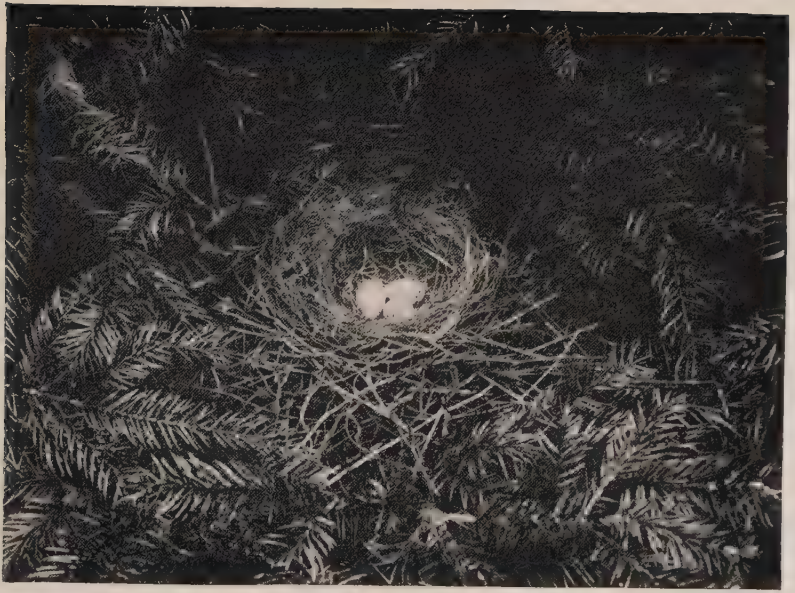

Photo. Chas. Reid.

BULLFINCH'S NEST

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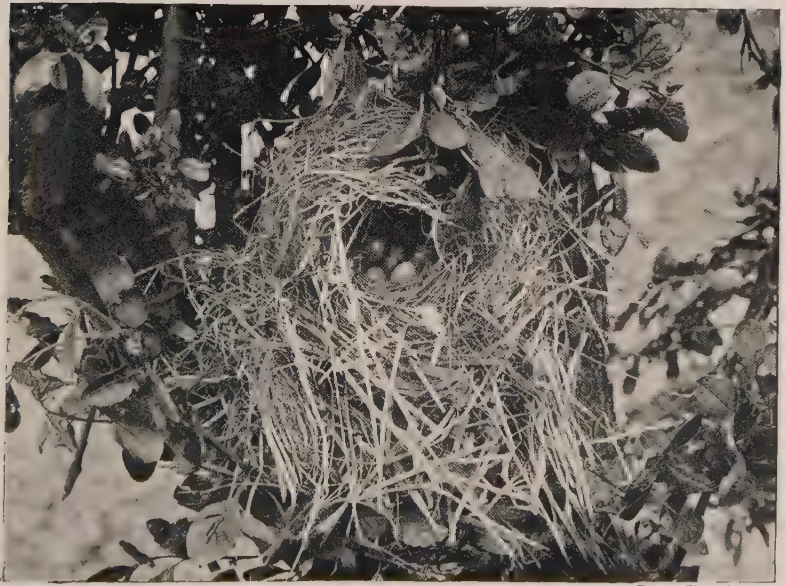

Photo. Chas. Reid.

SPARROW'S NEST

BIRDS AND THEIR NESTS—V

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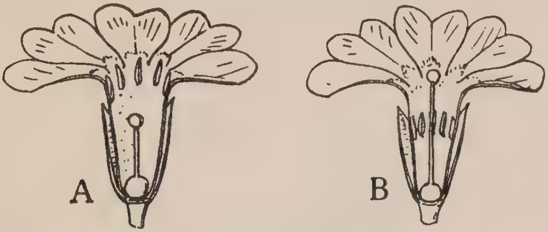
ent flowers are not found on the same plant, so that all the flowers which we obtain from one plant will be alike. (I mention this because you may pick two or three flowers from the same plant in the hope of finding this distinction.)

Some of the flowers have a very long style, which reaches *above* the anthers or pollen-bags; others have a short style, which ends *below* the anthers. These flowers are called "*pin-eyed*" and "*thrum-eyed*" respectively. Readers will see that the latter are able to pollinate themselves, as the pollen will naturally fall down on the stigma beneath when the anthers are ripe. In the former case, however, the pollen must be carried upwards by artificial means. This is done by insects—chiefly bees—which enter the tube and brush the pollen from the anthers on to their backs, carrying some of it to the sticky stigma when they depart.



A, Thrum-eyed Flower of Primrose. B, Pin-eyed Flower of the same.

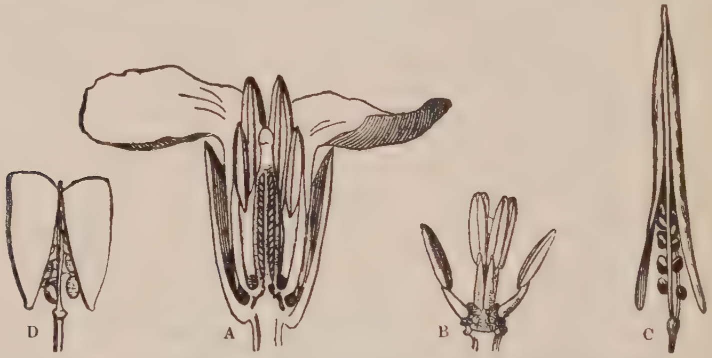
But more often than not the bees cross-pollinate the flowers. They carry the pollen from the pin-eyed to the thrum-eyed primroses; thus a long-styled flower receives pollen from a short-styled one, and vice versa.

These ovaries, thus fertilized, enlarge as in all other flowers, and form fruit. Soon the beautiful corollas disappear, and in time the fruits envelop seeds, which ripen and disperse.

# The Wallflower

This delightful spring flower is quite easy to obtain, and will make a capital subject to consider. It is found wild and also in the gardens. (See that you realize the reason why wild flowers are nearly always inferior in size, &c., to cultivated ones.)

The wallflower is one of the important family of **Cruciferæ**, that is, flowers in the shape of a cross. (As the readers know, there are various kinds of crosses, and this one they will compare with the St. John's Ambulance badge often seen on the sleeves of policemen's and soldiers' tunics.) There are four pretty petals, generally of a nice brownish-red or dark red colour. (Note that flowers have these beautiful petals to attract the insects. Their whole work is to prepare for the reproduction of their kind.)



A, Vertical Section of Wallflower. B, Stamens with Nectaries at their Base. C, Siliqua. D, Silicula.

There are also four sepals, and at the base of two of them may be found the nectar-bags.

Readers will count the stamens and see that there are six, and they will see that each stamen terminates in an anther or dust-box.

Following the stamens to their base, they will see the knob-like pistil. This will ultimately develop into the well-known **Siliqua** (see previous page).

The flowers grow in a bunch, the outermost ones opening first. (Why is this?)

Make a list of the cruciform flowers, and count their stamens, &c., if you can get any specimens. A few are the stocks, water-cress, mustard and cress, candytuft, turnip, and so on.

## Annuals, Biennials, Perennials

The reader need not be reminded that many garden seeds have to be sown every year, while certain flowers bloom the second year and then die off, and still others bloom year after year. Wheat, oats, barley, and beans have to be sown every year by the farmer; sweet-williams, foxgloves, and many others do not bloom the first year, but make their foliage, and burst into flower the second year. All the bulbs, pansies, primroses, buttercups, and daisies die off in the spring and autumn, and come up again year by year. The words *annual*—that is, a plant which lives for one year only—*biennial*—that makes its root and stem the first year and flowers the second year, then dying off—and *perennial*—that flowers year after year, losing its leaves in the autumn and springing into life again the following year—can be remembered easily as the most suitable words by which to describe these particular plants.

The formations of a bulb and corm have been fully described (see p. 78), and as many of the perennials are bulbs and tubers, it will easily be seen that they subsist year by year because they can store up food. After their flowers have died off, their leaves are very active in making food and sending it down to the tiny bud wrapped closely in the scales of the bulb, &c.

Annuals can be shown to be those plants which only make just enough food for one year. They "take no thought for the morrow", and therefore die. They do not "run a banking account" as the perennials do (simile and metaphor are helpful if not too complicated, and can serve as valuable aids to the memory).

The biennials are slightly more thrifty. They store up sufficient food the first year, so that they are able to make a strong flowering plant the next year.

## Summer Migrants

I hope readers are eagerly watching for the summer migrants. In the school in which I was a pupil teacher the boys in the senior classes kept nature diaries, and the first appearances of birds, fruit, flowers, &c., were all carefully recorded. One boy's father was a gamekeeper, and this boy generally came out top of the class with his list, and we were often indebted to him for nature-study—or object-lesson, as they were then called—specimens. One very mild winter he actually heard the cuckoo in the last week of February; but this bird is rarely with us before April.

## The Cuckoo

We all like to hear his almost human call—"cuck-oo, cuck-oo"—in this month, for we then feel that the spring has really arrived. Perhaps some of the readers know the old saw:

In April come he will;
In May he sings all day;
In June he alters his tune:
In July he prepares to fly;
In August go he must.

Another weather proverb tells us:

When the cuckoo comes to the bare thorn
Sell your cow and buy your corn;
But when she comes to the full bit
Sell your corn and buy your sheep.

The old rhyme which remarks upon him changing his voice is quite true. If we hear him in May he has a beautiful clear "cuck-oo"; in June he seems to have an impediment in his speech, as it is now "cuck-cuck-cuck-cuck-oo". Later on he is quite silent, and for the last month of his stay we hardly know he is here.

All the world knows that he does not make a nest, but selects the nests of other birds—artful creature that he, or she, is! She only lays one of her eggs in a nest, and so she probably chooses half a dozen different ones. Were she to lay all of them, say, in the hedge-sparrow's nest, this little bird would not sit on them, and, indeed, if she had the will, she would be physically unable to do so.

Cuckoo

Many are the different kinds of nests she chooses. The most common is the hedge-sparrow's; but it may be the water-wagtail's, finch's, lark's, linnet's, or nuthatch's that meets her eye.

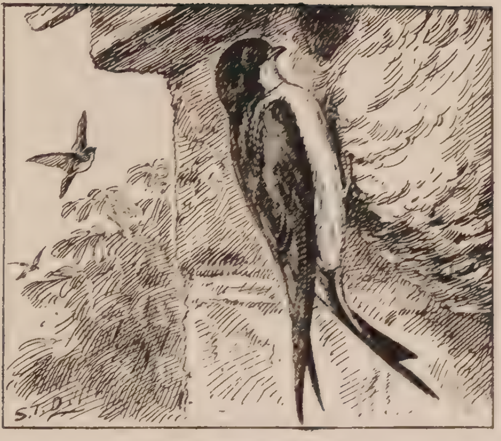
It will be noticed that these nests are all small ones, and as the cuckoo is rather a large bird, she is unable to sit on them to lay her eggs. Then how do they get there? She lays them on the ground and carries them to the nest in her beak.

As soon as her eggs are laid, her responsibility is at an end, for she cares nothing for her offspring. In due course the eggs are hatched by the various foster-mothers, and they have not seemed to notice the addition of one egg to their brood. Birds do not appear to notice "one" of anything. If you take *one* egg from the nest, the bird will not forsake it; but should you take two, it is generally fatal. If you add *one*, it makes no difference—provided, of course, that the egg is about the same size as the others; but should two or three be placed inside, then it is quite certain some of them will be thrown overboard.

If the *egg* of the cuckoo be about the same size as those among which it is placed, it is quite certain that the young cuckoo will not be. The bird grows very fast, and soon gets as large as its foster-parents. They feed it as regularly as if it were their own offspring, and, indeed, its larger beak and pushful ways get it the lion's share of everything. In time there is not room enough in the nest for all. The weakest go to the wall, and the young cuckoo pushes its companions over the side. The stupid foster-parents still feed it, until after a month or six weeks it is able to look after itself, and fly away.

Most children associate the cuckoo with a bird which eats other birds' eggs, and I have frequently heard boys say when they find an empty nest, "A cuckoo has been here before us". It does not eat eggs, but lives on small insects, larvæ, caterpillars, small beetles, and moths.

The cuckoo's "mate", as it is called, is the **Wryneck**. It generally makes its appearance along with the cuckoo. The wryneck belongs to the woodpecker family. It has an abnormally long tongue, and can protrude and retract it with lightning-like rapidity. It is called "wry-neck" because it makes a sinuous motion with its neck while the rest of its body is still.



House Martin and Nest

# The Swallow, Nightingale, &c.

Next in popularity to the cuckoo among our feathered visitors is the swallow, and it will make an interesting study. This bird goes very far south during the winter, even to Central Africa, Greece, and Palestine. It is remarkable to what enormous distances some migrants fly. About two years ago a Prussian ornithological society carefully marked four storks and released them. The birds were ultimately captured in the Transvaal, so that they had flown nearly six thousand miles. (This was rather a useful experiment, as hitherto it had been thought that European storks never migrated beyond Northern Africa.)

The chief distinction between the swallow and its companions, the martin and swift, lies in its long forked tail. The swallow's tail is quite twice as long as those of the other birds. It measures between five and six inches, and as its whole length is only about eight and a half inches from beak to tip of tail, it will be seen that the tail is approximately two-thirds of its body length.

Readers will readily recognize the nest, built most carefully with an outer cover of mud and lined with feathers

It is often placed in out-of-the-way places, as bell towers, old barns, &c., as well as under the eaves of the house. It is a splendid example of the bird plasterer. (It is always a good plan to associate birds, insects, &c., with trades, e.g. the stork, scavenger; the wood-wasp, paper-maker; and so on.)

Do swallows, martins, and swifts return to their old nests? Experiment clearly shows that in some cases they do. Birds have been captured on their nests, marked by secret signs, and liberated. The next year they have been again caught, and in several instances were the same birds. If this be the rule, it is a most wonderful case of instinct in guiding those birds thousands of miles, over mountain, forest, and ocean, to one little spot in the universe—an instinct, indeed, even surpassing human intelligence.

The characteristic flight of the swallow will be noted. It skims swiftly through the air with its mouth open. It has a very wide mouth and a sticky tongue, which entraps thousands of insects—its chief food.

Probably, with the exception of the robin, the swallow is associated with more superstitious customs than any other bird. Tonsilitis, quinsy, and bronchial affections yielded to a peculiar treatment which consisted of burning the body of the bird and applying its ashes to the affected parts. It foretold storms, and indeed there is some truth in this belief to-day. When a storm or wet weather is approaching, the insects—the swallow's natural food—fly close to the ground, and the bird follows them there; but in a spell of fine weather they mount to higher regions, so that we see the swallows at a great height.

Space forbids a detailed description of any other of our numerous summer migrants. Should you want to study further examples of them, the following would be very suitable. They all appear from the latter end of March up to the middle of April: Turtle-dove; Night-jar; Spotted Fly-catcher; Quail; the Warbler family, including the Willow, Garden, Reed, Wood, and Grasshopper varieties; Red-backed Shrike; Tree Pipit; Kentish Plover; Greater and Lesser Whitethroats;

Photo. Chas. Reid.

SWALLOW'S NEST

*Page 98*

C 257

Photo. Chas. Reid.

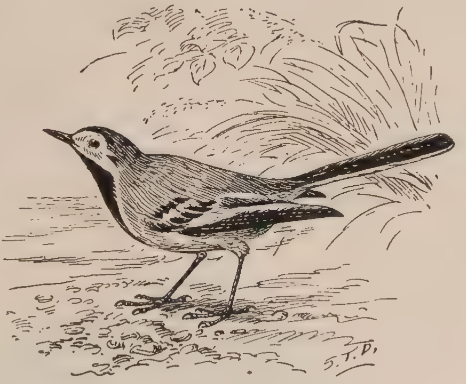
YOUNG SWALLOWS

BIRDS AND THEIR NESTS—VI

Whinchat; Redstart; Corn Crake; Stone Curlew; Chiffchaff; Ring Ouzel; Nightingale. Some of these are resident, but greatly reinforced by migrants during the summer.

Probably the **Nightingale** is the best known of our migrants, next to the cuckoo and swallow, more on account of its lovely song than of its general appearance, for we rarely see it close enough to examine it. Its song may be heard at almost all hours of the day or night, with the exception of the evening or dawn. Truly there is no other voice so beautiful and pure in the whole of creation! It throws out its long-continued strains of song through the stillness of the night, and well does it merit the title "Queen of singing-birds".

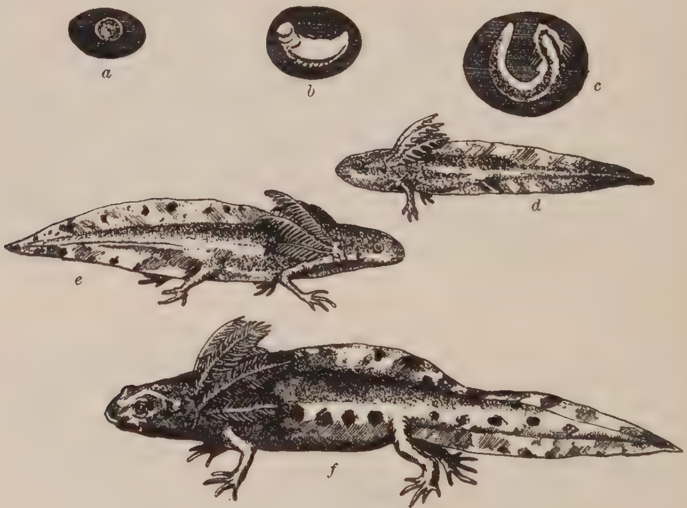
The **Water Wagtail** will be noticed jerking its long tail when running or perching by the riverside. It is a pretty little bird, with dark-coloured upper parts and a nicely shaded greyish-white breast and under parts. It is the shepherd's friend, and also, indirectly, the butcher's and woollen merchant's. Its great titbit is a kind of small snail, which it kills in large numbers. A parasite lives on this snail, called the liver fluke. Grazing sheep invariably swallow the snail, and, of course, its parasite with it. The dreaded liver fluke fastens on the poor sheep's liver and even its brain, and gradually eats them away. Thousands of sheep are annually killed by this destructive parasite, and therefore we can quite understand how the shepherd appreciates the active little wagtail.



Water Wagtail

# The Pond

This is the time when great activity commences in the pond. When you decide to make an organized trip to it, you should carry clean jars, a rake, a small dredging-net, and a stout net shaped like the butterfly net, but with very fine meshes. (Such a net can easily be made by bending a piece of stout iron wire into circular shape and pushing the two ends into a bamboo pole. Fasten a strip of stout calico round the wire, and attach to this a net of book muslin or gauze.)



Growth of the Newt

*a–c*, Changes within the egg; *d*, with gills and front pair of feet; *e*, *f*, with both pairs of feet.

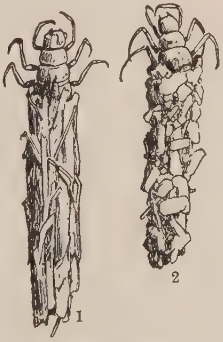
The jelly-like **spawn of the Frog** will first attract the children's attention. A little of it may be scooped into one of the glass bottles, half-filled with water, and kept for continued observation. The tiny tadpole will wriggle out of the egg, legless and nearly shapeless. The casting of its tail, and subsequent development of the legs, never fail to interest.

**Newt spawn** may similarly be dealt with. This is perhaps more interesting to watch than that of the frog. The two tiny claspers enable the feeble tadpole to fasten itself securely to the water-weeds soon after it is hatched. After a fortnight the two fore legs should appear, and its eyes are now visible. In another week the hind legs are formed, and fully developed in another fortnight. Thus the reptile affords us an interesting study for six or seven weeks under the continued-observation method.

**Water-bugs** and **Water-beetles** are interesting captures to make, and readers may see terrible fights between some of them. The most formidable is the **Great Water-beetle**, which will want a jar quite to himself. The two hind legs are very broad, and make splendid paddles, especially as they are fringed with long, stiff hairs. Their grubs are even more warlike than themselves, and will destroy and devour all other insects that come across their path.

The **Whirligig Beetle** may be seen whirling round and round on the surface of the pond. It could be placed with other creatures in the jar, as it is of a peaceable disposition.

The **Caddis Worm** is a most interesting grub to watch, in its little case of straw and wood. Lying on the mud like a piece of dry rush or twig, you would scarcely notice it. All kinds of materials are used in the construction of its case. Sometimes sticks, leaves, tiny flints, or moss form part of the dwelling. When the grub has commenced building, it shuts itself up inside its case and puts out the front half of its body to provide materials to complete the case. The front of the case is always left open, so that the creature can protrude its head.



Caddis Grubs

1, In case of grass stalks.
2, In case of small stones.

An interesting experiment may sometimes be successfully performed by placing a few caddis grubs in the aquarium, and surrounding them with small beads. Very often the grubs weave these beads into a compact case, in which they lie for some time. In time the grub emerges into the caddis-fly, which may be seen at this season running swiftly along on the surface of the rivers or ponds, a prey for the leaping trout, and a much-sought-after bait by anglers.

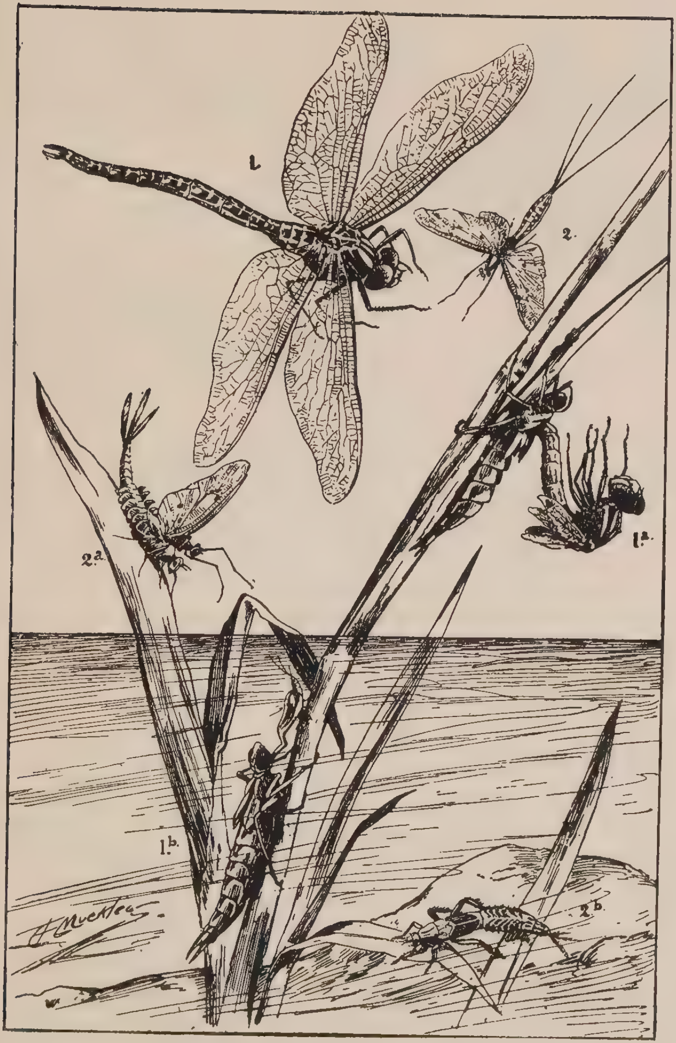
The larva of the **May-fly** may sometimes be seen on the mud, although it is frequently completely buried for about two years. After this time the insect emerges, and, like the dragon-fly, fastens itself to some leaf-stalk above the water, so that its wings are dried and it is able to expand them properly. Soon its outer skin splits and falls off. The insect then flies off, dancing about up and down the river. Readers will understand the angling notice, "The May-fly has risen". It lays a cluster of tiny eggs in the night, and at once dies, only surviving in its perfect state for nine or ten hours.

One most interesting pond creature to watch is the "tiddler", or stickleback. You never tire of watching the rapid actions and desperate battles of this little warrior. It is the only fish which builds a nest (see p. 143).

*Nature Study for the Month:*

1. The Primrose.
2. The Wallflower.
3. Annuals, Biennials, and Perennials.
4. Summer Migrants.
5. The Cuckoo.
6. The Swallow.
7. The Pond and its inhabitants.
8. The Caddis-fly and May-fly.

*Flowers of the Month:* Bush Vetch, Bramble, most Fruit Trees (as Apple, Pear, Cherry, Peach, &c.), Dead Nettle, Common Orchis, American Currant, Rest Harrow, Wild Hyacinth, Germander Speedwell, Broad-leaved Garlic, Solomon's Seal, Parsnip, Lady's Smock, Fritillary, and Ragged Robin.



1, Dragon-fly; 1*a*, Dragon-fly escaping from chrysalis; 1*b*, Larva of Dragon-fly.
2, May-fly; 2*a*, May-fly escaping from chrysalis; 2*b*, Larva of May-fly. (See p. 142.)

And after April, when May follows,
And the white-throat builds, and all the swallows—
Hark! where my blossomed pear-tree in the hedge
Leans to the field and scatters on the clover
Blossoms and dewdrops—at the bent spray's edge—
That 's the wise thrush; he sings each song twice over,
Lest you should think he never could recapture
The first fine careless rapture!
And though the fields look rough with hoary dew,
All will be gay when noontide wakes anew
The buttercups, the little children's dower
—Far brighter than this gaudy melon flower!
—*Browning.*

The "merrie month of May", favourite time for poet to weave his romances around the village green and the old-time May-pole, is now upon us. Nature Study is pre-eminent this month. Never an hour but has its full quota of suitable objects, whether it be on flower, fruit, bird, or insect. We probably see more blue wild flowers in May than at any other time of the year, and this is fit season for those rare blue flowers, the wild hyacinth, tiny and delicate forget-me-not, speedwell, and, later on, the blue milkwort and cornflower.

Galls present an interesting study this month. In England it is not an uncommon thing to see children going to school decorated with oak-galls in celebration of "Oak-apple Day".

The leaves have all unfolded, and in their freshness of colour and form, unscorched by the July sun and unscarred by wind or thunderstorm, this is undoubtedly the best season for a study of vernation.

The common buttercup and daisy carpet the pasture-lands and lawns, and the coarse roots of the dandelion have sent their stems above ground, choking the finer roots of the grasses.

In insect life the spider may be chosen as a suitable subject where real objects are provided, and the dragon-fly may be analysed. A ramble along the river reveals the kingfisher with his gaudy plumage, and water voles and shrews may be seen swimming round the nests of water-hen and coot.

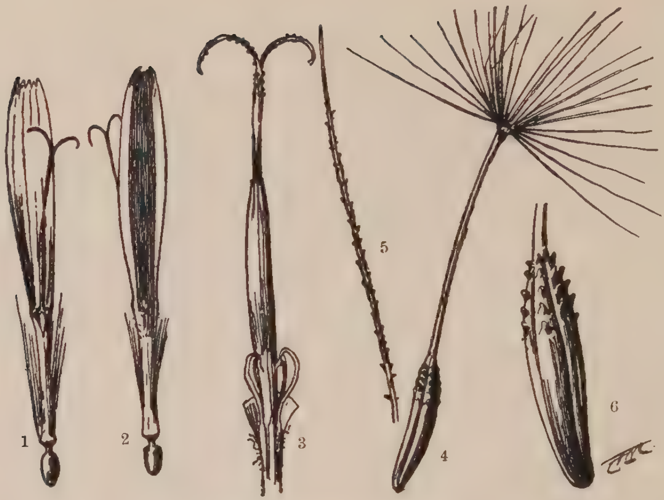
In some districts May-day revels are still kept up, and in this connection that lovely descriptive poem of Tennyson, "The May Queen", never fails to appeal. The hawthorn blossom will of course be closely studied.

## The Dandelion

Readers will note the various ways in which the dandelion grows. On the lawns, if it escapes the gardener's trowel, it will shoot its leaves quite upright in order to obtain the sunlight, but along the paths it sprawls about in all directions, as its leaves can obtain sufficient light even in a horizontal position.

By sketching the leaves readers will notice their irregularity of shape, and if they squeeze the stems they will find that a milky fluid oozes from them. The uses of this fluid as a protection from insects and grazing animals—it has a very bitter taste—are obvious.

By carefully dissecting the flower-head the reader will see that there are a great many flowers. The word **floret** may now be introduced. Each floret has five notches representing the five petals. Compare the Daisy and Chamomile,



Parts of Dandelion (enlarged)

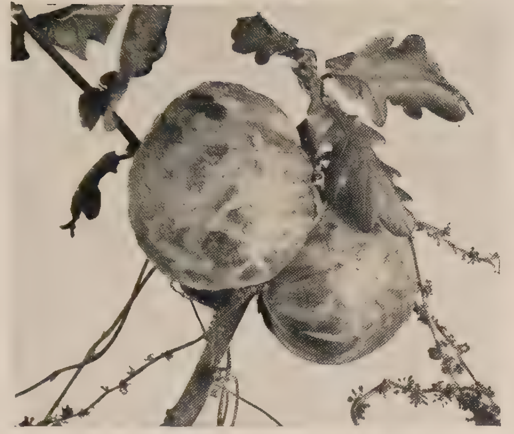
1, 2, Floret, back and front, showing attachment to seed-case. 3, Pistil and anthers. 4, Seed-case and down top. 5, Single hair of down (more enlarged). 6, Seed-case.

and note the suitability of describing them as **composite flowers.**

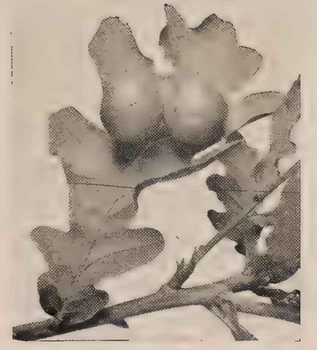
The "clock" is composed of fine silky hairs, supported by a fine thread which holds the seed-case below. These fine silky hairs compose a **pappus.** Observe the ease with which pappi can be dispersed.

## Galls and Gall-flies

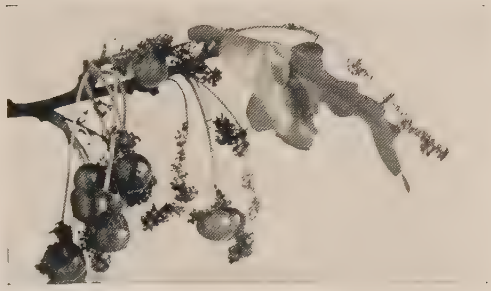
It is truly remarkable what great unanimity of opinion there is among children with regard to the formation and structure of galls. Let us take, for example, one of the best-known galls, the common oak-apple. Most of my readers could procure specimens during this month. Probably because of the misnomer "apple", most children conclude this gall to be the natural fruit of the oak tree, just in the same way that the apple is the fruit of the apple tree. And, following their arguments out logically, I have frequently found children telling me that the "apple" was formed from



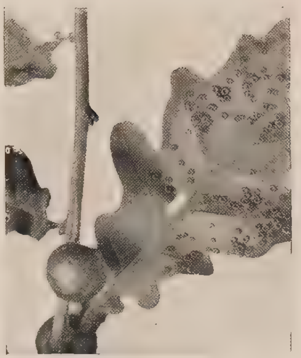
OAK APPLES



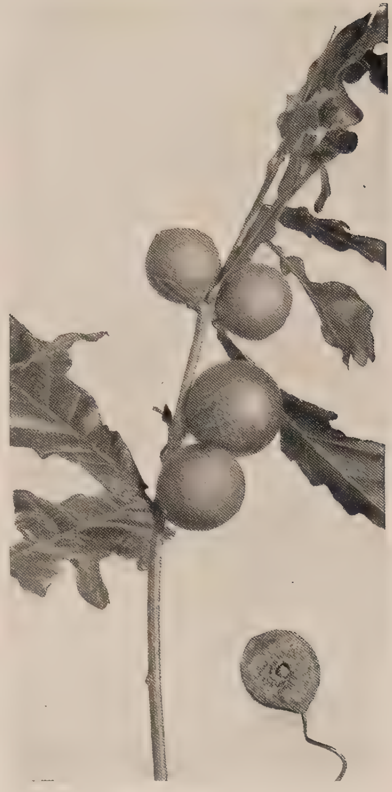
"CHERRY" GALLS



"CURRANT" GALLS ON CATKINS



"SPANGLE" GALLS

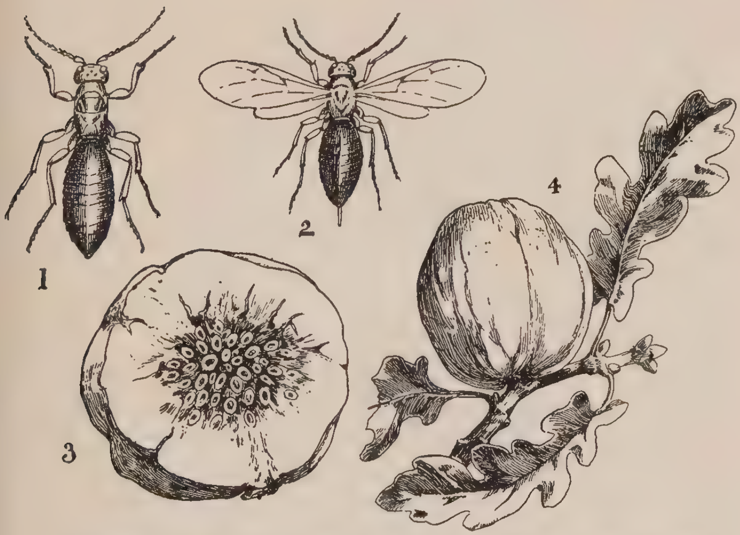


"MARBLE" GALLS

GALLS ON THE OAK (From Photographs by Henry Irving)

the flower which they saw on the tree earlier in the year. Of course I naturally asked them for particulars of the acorn which they were fond of picking in the autumn. This sorely perplexed them, as here was a tree which produced two entirely distinct and quite dissimilar "fruits".

Though for nature students of maturer years, the oak-apple will not, of course, present such a mystery, the process of its formation and its real nature are very frequently misunderstood even by them. It is by no means unusual for people to imagine that galls are natural deformities of the tree; or they may have gathered that they are caused by the insect, which, after their formation, uses them to receive her eggs. In any case, they entertain the belief that the gall was there before the eggs. This common idea is, of course, entirely erroneous.



1, Gall Insect, wingless female (magnified). 2, Gall Insect, winged female: second generation (magnified). 3, Section of Oak-apple, showing grubs. 4, Oak-apple.

[The life cycle of the oak-apple gall fly is very remarkable. The wingless ant-like insect (1) lays its eggs in winter in the buds of the oak. Its offspring, when mature, is the *winged* form, of which the female is shown above (2). The eggs of the latter are laid in summer in the rootlets of oak trees, and again a brood of *wingless* females is produced.]

By far the best way is to dissect the gall very carefully and *find the actual eggs.* The shape and size of the "apple" will, of course, be first commented on, and also the irregular depressions on the surface. The reddish tinge and smooth skin will be noted.

When you dissect the "apple" do so in a *vertical* direction. The reason of this is that there will be found a large number of fibres running through it in the direction of the stem.

Next make a horizontal section of one of the halves. You will then be able to distinguish the fine, oval-shaped granules, *each of which contains a grub.* These granules lie in a pulpy formation much resembling the flesh of the real apple.

If your gall be a fully developed specimen, you may find each fibre ending in a granule. This could be compared to a little river running into a lake. Réaumur, the great naturalist, says that the "fibres are the diverted nervures of the leaves which would have sprung from the bud in which the gall-fly had inserted her eggs, and actually do carry sap-vessels throughout the substance of the gall".

You may learn a great deal about the gall without very much difficulty by observation, as described above, but the subject presents certain problems for which you must seek a solution by inference. The destructive fly which causes the gall's formation is exceedingly small, and you may not find it possible to secure a specimen. You may, however, arrive at a good deal of information about it by recalling certain details that you already know concerning other creatures of similar habits. For example, you will recall your autumn examination of the tiny holes made in hazel nuts, your learning of the weevil's habit of laying her eggs in the soft nut, and her way of doing it. You will naturally come to the conclusion that the equipment of a creature like the gall-fly must include some sharp instrument with which to prick the hole in which her eggs are to be deposited. The **ovipositor,** as this instrument is called, is a great deal longer than the insect's body. It commences near the extreme point of the insect's abdomen, runs all along the curved back, turns at the breast, and curves round the abdomen downwards. (This detailed description is after Réaumur.) The readers will compare this mechanism with the sting of a bee or wasp. They may have pulled that of the former insect out of their hands, and seen a horny pointed substance of a chestnut colour. The ovipositor of the gall-fly is a somewhat similar contrivance.

"But," any thinking person would ask, "how does this cause the 'apple' to form?" There has been much diversity of opinion on this among the older naturalists. Rennie's theory, however, is the most logical. He tells us that the insect covers her egg with a glutinous substance, and this prevents the sap that flows through the puncture made by the ovipositor being spread over the outside of the leaf and wasted. This sap is thus kept to the space occupied by the eggs, and expands and forces out the pellicle of gluten that confines it until it closes up the puncture, thus checking the escape of the sap and completing the process.

It will be noticed that where galls are formed on the actual leaves of trees, such as those of the rose tree, oak, or willow, there is a malformation and discoloration of the leaf. This is due to the loss of sap, and the disarrangement of the chlorophyll or colouring grains. On the back of oak leaves are found "cherry" galls, round and red like the fruit; and also the small flat or rounded galls, known as "spangles".

It would be well to observe as many examples of galls as possible. For of course there are many besides the oak-apple. In addition to those I have just mentioned, of which actual specimens can easily be procured, there are the **hard and woody oak-galls** ("marble" galls), which are to be seen adhering to the surface of the twigs of the oak tree. When one is dissected, it will be found to be of a spongy nature; but in these galls there is only *one* insect, or grub, contained in each.

The **Currant Galls** on the catkins of the oak will also make an interesting study. The reader will compare them with bunches of the fruit after which they are named. Galls on the leaves of the currant-bush are also very common, and the reader should have very little difficulty in procuring specimens. The same remark applies to galls on the hawthorn and poplar.

It will thus be seen that there are great possibilities in galls as a subject for a special department of Nature Study, and their varieties are so many that the reader who chooses to specialize will find that he has taken up a branch of very considerable complexity.

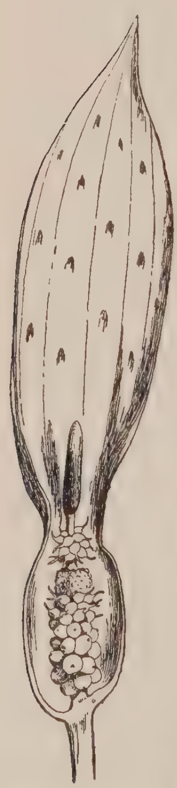
## The Cuckoo-Pint

The "Parson-in-the-pulpit", as children are fond of calling the Cuckoo-pint, belongs to the Arum family, and may be found growing in the hedgerows. It affords a splendid example of insect protection.

The leaves of the plant, like those of the Daffodil, spring directly from the ground. They are arrow-shaped, and of a rich green colour. The beautiful "poker" will attract the observer most. It is of a purple colour. If it be closely examined, there may be found many anthers, and underlying them the seed-boxes or ovaries. The poker will be compared with that of the Arum Lily and other members of this important class. Jean Ingelow speaks of the poker as a clapper of a bell:

O cuckoo-pint, toll me the purple clapper
That hangs in your clear green bell!

At the base of the poker is a row of stiff hairs. Suppose an insect to be crawling down the poker, it would pass these hairs, as they would be bent downwards by the weight of the insect. Underlying the hairs


Section of Flower of Cuckoo-pint

are the anthers, immediately above some useless ovaries. At the base are the true ovaries. The insect finds no nectar until the flower is mature. It tries to return, but the valve-like hairs prevent it doing so, as they will not bend upwards. The insect is thus entrapped, and remains so until the ovaries exude the honey and the anthers burst, after which the hairs will quickly die away and it escapes.

## Climbing Plants

You will not be able to make a study of these plants when specimens of every kind can be obtained, for they do not all appear at the same time. Under the circumstances it is better to refer to them when the earliest specimens appear, so that continued observation points out the later varieties.

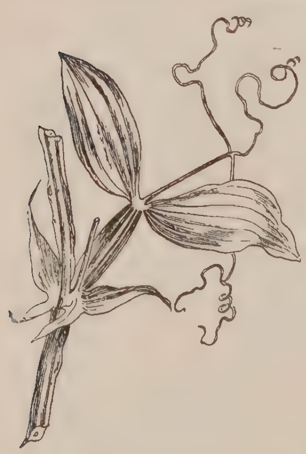
The reason why they climb will, of course, be fully understood. With their weak stems, they would sink in a tangled mass on the ground, and insufficient light would be obtained. (The readers may have seen a heap of runner beans lying on the ground after the sticks have broken away; if so, they will have noticed, after a day or two, that the under side of the heap has turned to a sickly yellowish colour.)

The most interesting part of this subject consists in noting the various methods the different climbers adopt to support themselves on their props. They all make a desperate struggle, as it were, to rise above their neighbours. There is terribly keen competition going on among them; they are all greedy for the light, so that the chlorophyll grains of their leaves may be able to work and make the rich plant food.

It will occur to some observers that climbers seem to exhibit great pluck. Many of them come into the world weaklings, lying down on the surface of the ground with their little stems, while their sturdier companions push them aside and soon tower above them. But note their cunning! They wait until the other plants have risen, and then they fasten their tendrils, stems, &c., on to them, making them their slaves. Soon they reach above their companions by their sheer pluck and persistence, and they may be seen waving their leaves and nodding their flower-heads much higher than the rest of their companions of the hedge. Such examples are the Convolvulus, Bryony, and Bramble.

**The Use of the Stem.**—Examples of stem climbers are the Runner Bean and Bindweed. Watch how the "runners" in the garden grow. At first they do not climb; but when they are nearly a foot high they will begin to turn round or grope about, as it were, for an object on which to wind their stems. When the stem has commenced to twine, it is only the front part which increases in length. (If you tie a piece of cotton very lightly around the stem and support, you will see that it remains in that position though the top of the stem is rapidly lengthening, thus proving that when a stem has wound itself round a support that part does not grow any more.)

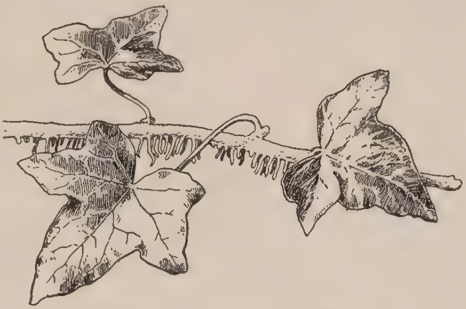
**The Use of Tendrils.**—Examples of these are the Sweet Pea, Common Garden Pea, and Grape Vine. The tendril is a little finger-like projection of a thready nature. There are the leaf-branched tendrils corresponding to compound leaves, and single tendrils to simple leaves.


Tendrils and Stipules of Pea

When the tendril is fully developed, or unwound as it might be expressed, it will cling to any twig or string, thus holding the plant's leaves up to the light and air. (Take notice that the thinner and more bushy the supports are the better; in the supports for Sweet Peas it is much better to use pea sticks than string, as the former have far more little branches for the tendrils to cling to.)

**The Use of Prickles.**—Examples are the Wild Rose and Brambles. (See pp. 37 and 145 for description.)

**The Use of Leaves.**—Examples: Nasturtium and Clematis. These plants twist the stalks of their leaves tightly around their supports, generally lying along the hedge top.


Stem of Ivy, showing Rootlets

**The Use of Roots.**—The best example of this is the Ivy. The small roots grow out of the stem and fasten themselves most securely into the crevices of walls, trees, &c. If the readers examine these roots, they will see that there are no tiny root-hairs—the chief part of a root—and therefore, though the ivy sends its roots into a tree in a somewhat similar manner to the mistletoe (see p. 56), it does not extract nourishment from it. (Some readers will give you the ivy as an example of a plant which lives on another one (see Parasitic Plants, p. 56), and it would be well to explain that it is not parasitic.)

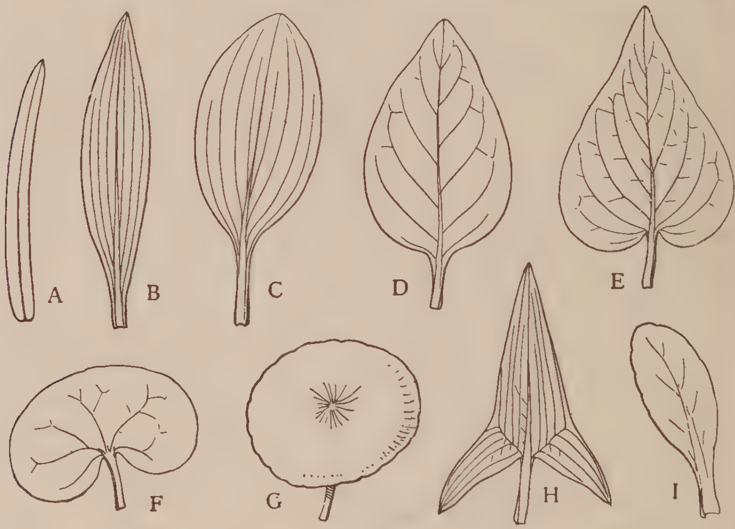
## Leaves of Plants

All leaves are either simple or compound. Simple leaves may be said to be those consisting of one blade, while compound leaves have two or more blades.

The formation of a leaf-bud has already been fully described (see pp. 59 and 60). The *stipule* (Lat. *stipula*, a stalk) is a small appendage at the bases of most leaves. It may be most clearly seen on the Common Pea or Vetch.

**Shape of Leaves.**—To begin with, these should be carefully noted, and the botanical names ignored. It would be advisable to get as great a selection of leaves as is possible, and then classify your specimens in accordance with each leaf's shape. Thus the grass blade shows the blade form; the box, oblong; the willows, tapering; the horse chestnut, inverted egg shape, that is the *broad* oval end at the top; the beech, pointed oval; and so on.

**Leaf Types.**—Two; the net-veined and parallel-veined.



Some Shapes of Leaves

A, Line-like. B, Lance-shaped. C, Oval. D, Egg-shaped. E, Heart-shaped.
F, Kidney-shaped. G, Round. H, Arrow-shaped. I, Spoon-shaped.

Trace these veins out on the Lime and Daffodil, and also show the midribs. Compare the midrib veins and tiny branching veins with the large veins and capillaries of the human body, and note that both have much the same function. (The main function of leaves has already been mentioned many times.)

**Arrangement of Leaves on the Stem.**—Several examples of twigs, branches, and flowering plants will make this investigation very interesting. The great object of the leaves is to become exposed to the sunlight. (If a plant were kept in

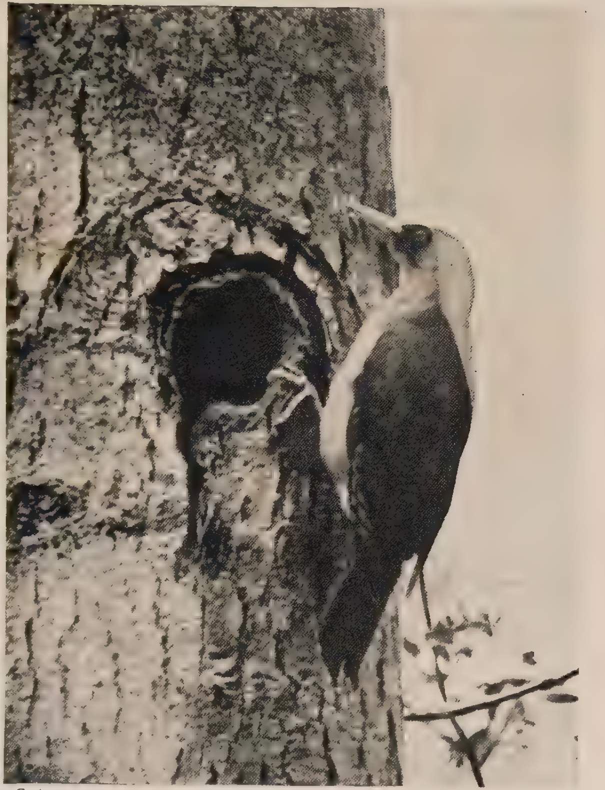


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Photo. Walter Wilson.

GREEN WOODPECKER AT NESTING-HOLE

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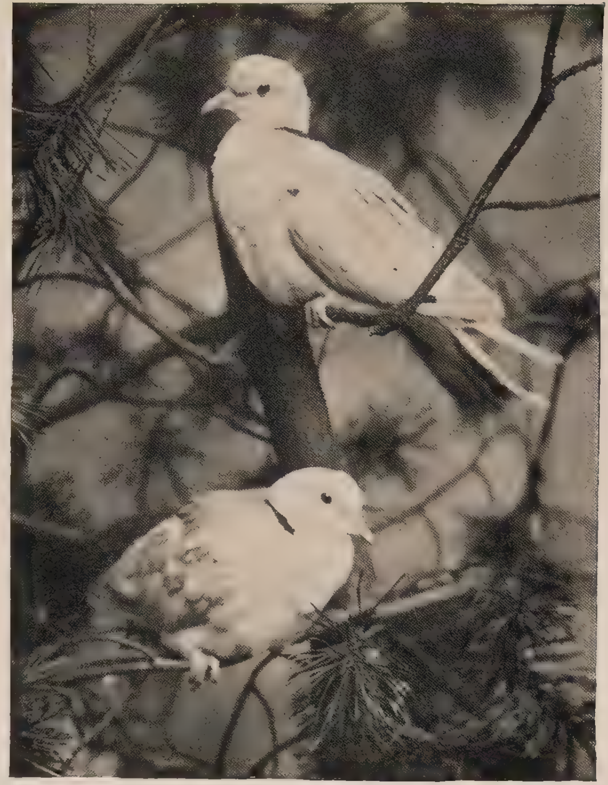
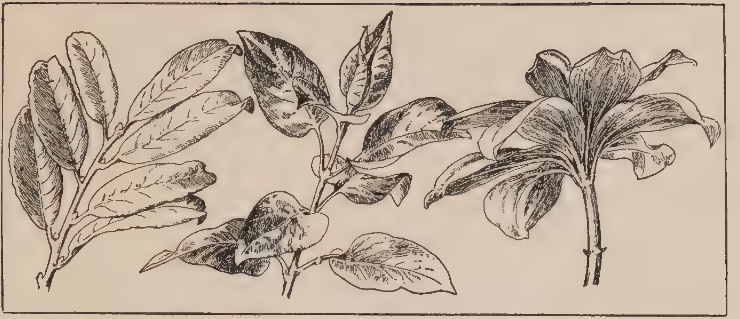


Photo. Chas. Reid.

RING-DOVES

Page 62



Arrangement of Leaves on Stem

a dark cellar the leaves would be sickly, of a yellow colour, and very unnatural.) The lower branches of a tree spread out far more than the upper. Why is this?

**Opposite Arrangement.**—A good example is the Horse Chestnut, whose buds are placed exactly opposite to each other on the stem. One pair of leaves is at right angles to the pair above or below.

**Whorled.**—Those cases where three or more leaves grow together and form a collar round the stem, as in the Woodruff.

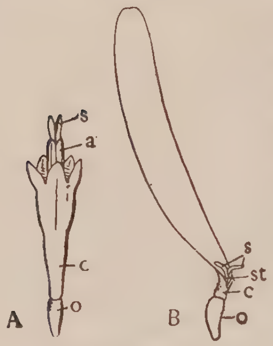
**Alternate.**—Where the leaves come singly at intervals up the stem. The leaves may be arranged in two opposite rows, as in the Elm, or spirally, as in the Oak.

**Tufted.**—Where several leaves spring up in tufts.

(The structure and uses of hairs, tendrils, thorns, prickles, and scales, together with the cause of the change of colour and the autumn fall, have been described in previous chapters.)

## The Daisy

This common little flower, originally known as the "day's eye", because of its resemblance to the sun, may be found in most meadows. The leaves are spread out flat along the ground, thus ensuring as much sunlight for themselves as possible, but at the same time choking other plants. (Readers will see that in all plant life the weakest invariably goes to the wall, and that plants are always extremely selfish as regards the light and their leaf arrangements.) They are arranged in the form of a rosette, and those at the base are larger than the ones above. (Note the similarity in the boughs of a tree.)



A. Disc Floret of Daisy. B, Ray Floret of Daisy. *o*, Ovary; *c*, corolla; *a*, anther tube; *st*, style; *s*, stigma.

The reader will notice the Daisy flowers at night, and compare with the Chamomile. Why do they close? Also notice the two kinds of florets—disc florets and ray florets. A flower with numerous florets is known as a **composite flower**. It is a perennial. How does it store its food? Note the **rootstock** of the plant.

## The Hawthorn

Amongst the many buds proclaiming May,
Decking the fields in holiday array,
Striving who shall surpass in braverie,
Marke the faire flow'ring of the Hawthorne tree.
Who, finely clothed in a robe of white,
Fills full the wanton eye with May's delight.
—*Chaucer.*

Few flowers of spring are more popular than the Hawthorn blossom, or "May" as it is popularly called. It seems thoroughly in keeping with our sunny landscape. You must certainly include it in your May list of subjects if you wish to be topical. It will be best to make a study of flowers, leaves, stems, and branches combined. The prickles will be noted and dealt with as in a previous chapter. (See remarks on Bramble, p. 36.) The leaves are alternate and egg-shaped, having the larger end of the oval at the apex. The flowers are rather small, and of a white colour tinged with pink. These light-coloured petals attract the insects, which speedily fertilize them. The berries which follow are called "haws", and make splendid food for the winter migrants. They grow in groups, each cluster containing from six to nine berries. (For description of Berry, see p. 36.) The Hawthorn belongs to the large and important Rose family.

## The Iris, or Flag

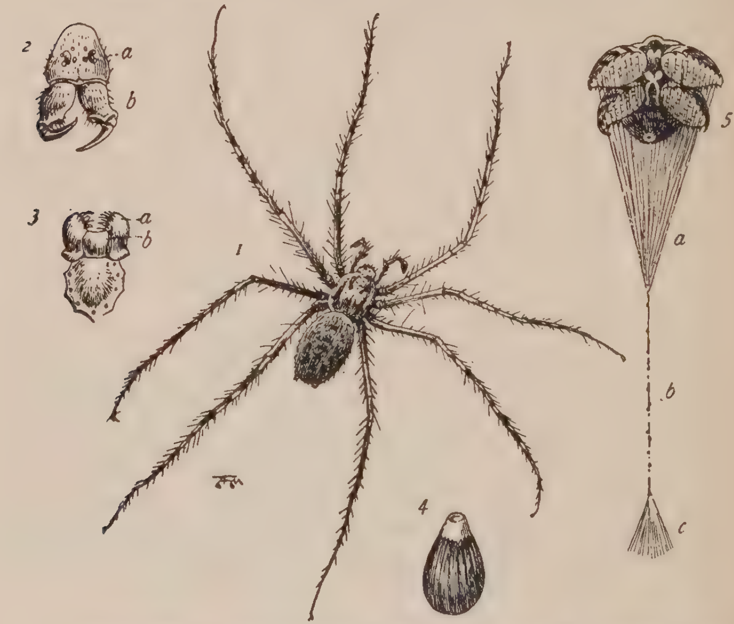
If these beautiful flowers were more uncommon, they would be considered one of the most valuable of our British flowers. Their leaves are sword-shaped, and they have a very stout rootstock which enables them to bloom so early. The British wild Iris has yellow flowers, but the garden species are of varied colours. The anthers, stamens, and ovaries can be plainly seen. The reader will notice that the flag is one of the plants that love marshy ground.

## The Spider

The spider, besides being celebrated in superstition, legend, and nursery rhyme, is an interesting creature for its own sake. Examples of the various kinds are easy to obtain. Should you wish to have a web for close observation, you can remove one carefully from its original position and attach it to a piece of lightly gummed wood. This, however, should hardly be necessary.

The spider is not a true insect, because its body is divided into *two* parts instead of three. (Of course, you will contrast this with the bodies of the Ant, Wasp, Bee, &c.) It also differs from an insect because it has four pairs of legs, that is, one pair more than are present on the insect's body. (For the sake of comparison, the reader should keep the body of some insect before him. The differences between the spider and the true insect will thus impress themselves on the mind.)

The eight legs and two feelers are all joined to the upper segment. The lower and larger segment contains the **spinnerets.**



1, House Spider. 2, Front of head (*a*, eyes; *b*, mandibles). 3, Under side of jaw (*a*, true jaw; *b*, lower lip). 4, One of the air chambers. 5, Spinnerets (*a*, minute web threads in moist sticky glue; *b*, threads stuck together, with globes of glue at intervals; *c*, anchor of web.)

There are eight eyes protected by a bony covering. Spiders, like flies, can see in all directions at once. Notice the ends of the antennæ. They look like claws. They really contain a venom which kills the spider's prey after the feelers have struck it.

The spider does not undergo the metamorphoses that most insects, as the butterfly and ant, do. It is hatched from the egg a spider, and dies a spider. This creature is a lung-breather, while most insects inhale air through an enormous number of minute air-tubes running through every part of their bodies. The most interesting part of the study will be the observation of the wonderful spinnerets. There are four of them placed near the creature's tail. From its four spinnerets the spider can produce four thousand separate threads. These spinnerets thus have a sieve-like arrangement through which these sticky strands pass. When they leave the spider's body the air soon hardens them. But these threads are so extremely fine that the spider could not use them for any practical purpose. It therefore weaves them into a rope with its back feet.

In the making of the web the creature shows her wonderful powers as an architect. If you are fortunate enough to see her at work you will notice that she securely fastens one end of the thread to the wall, and then travels to the opposite side, drawing the rope after her, and fastening it in a similar manner. She tests this improvised tight-rope many times before she is satisfied with it. When the foundation or "scaffolding" is thus laid, she makes a series of cords meeting in the centre like the spokes of a wheel. Finally she commences at the centre, and makes an ever-widening circle until the outside of the "spokes" is reached. As the thread crosses the "spokes" it is fastened by a little gum. (The reader would find it interesting to make a careful sketch of the web in detail.)

This description applies to the House Spider, but there are other members of the family which construct quite as ingenious homes. The **Water Spider** is provided with a hairy dress which encloses air, thus allowing it to go down to the bottom of the pond and construct its home between two pebbles. There is a tiny hole at the bottom of this little hut, through which the spider enters or leaves. As air is lighter than water it will not escape, but is imprisoned by the roof of the hut.

The **Trapdoor Spider**, which is very common in Southern France, selects a long tunnel in the ground and carefully lines it with a silken tapestry. This prevents the water from soaking through the walls. The "gate" is made of thirty or forty layers of earth and web, and to the outside of it there are gummed a few dead leaves, so that it matches the surrounding earth. Two small holes are left in the "door", so that the spider can insert its claws and shut the gate after it when it enters its home.

You have frequently seen the Garden Spider's den on the bushes in the hedge. All of it is spun with silky thread. A number of small insects may often be seen entangled in the web, for all spiders construct these dens for the purpose of catching their prey. It is not fair to regard the spider as the wicked ogre amongst living creatures. It is only a very clever trapper, bent, like other creatures, on obtaining its food.

When the spider wishes to lay her eggs she spins a kind of cocoon in which to place them. The number laid varies, sometimes amounting to about a dozen, and at other times running into hundreds.

*Nature Study for the Month:*

1. The Dandelion.
2. Galls and Gall-flies.
3. The Cuckoo-Pint.
4. Climbing Plants.
5. Leaves of Plants.
6. The Daisy.
7. The Hawthorn.
8. The Spider.

*Flowers of the Month:* Solomon's Seal, Coltsfoot, Horse Chestnut, Hawthorn, Iris, Cuckoo-Pint, Field Poppy, Sallow, Deadly Nightshade, Rest Harrow, Heart's-Ease, Cowslip, Buttercup, Daisy, Dandelion, White Campion, Woodruff, Bird's-foot Trefoil, White Bryony, Chickweed, Lilac, Laburnum, Beech, Ash, Oak, &c.

"Summer is coming, summer is coming,
I know it, I know it, I know it.
Light again, leaf again, life again, love again,"
Yes, my wild little Poet.
. . . . . . . . . .
"Here again, here, here, here, happy year!"
O warble, unchidden, unbidden!
Summer is coming, is coming, my dear,
And all the winters are hidden.
—*Tennyson, "The Throstle".*

The association of poetry with Nature Study seems a natural one, since wild nature has inspired many of the most beautiful poems, and the student turns with gratitude to the poets who have put into words his sense of the beauty which his observations reveal to him. Tennyson was a most acute observer, and over and over again in his works we find instances of the way in which he could combine lyrical expression with accurate description. "The Throstle" is a striking example of his power of expressing one of Nature's moods.

The third line of the first verse is hard to beat for terseness and beauty of phrase. How admirably it describes this season! All Nature is now thoroughly awake, and if a plebiscite were taken as to which month of the twelve we liked best June would take a leading place.

Moths and butterflies will attract our attention this month, and, in their immense variety, offer endless subjects for study. Luscious fruits, as strawberries and cherries, reach us from the Channel Islands, and if we run short of subjects, a pound of them from the greengrocer's stall will provide admirable material. Peas will be in full bloom, and the fruit will appear towards the end of the month. A trip up the river will reveal the kingfisher just bringing off her brood in the nest of fish bones down by the bank. The stickleback may be captured from the pond and placed in the aquarium. "Chestnut Sunday" has gone, but the beautiful blossom will still be seen early in the month. Laburnum and lilac shrubs are in full bloom. Some of the nesting birds have not yet completed their work, among which are the swallow, martin, red-backed shrike, reed warbler, and turtle-dove.

The rhododendrons are a beautiful sight now, particularly in gardens or parks, such as Bostal Heath, near Woolwich, where they are massed together, displaying their various hues. Thousands of insects are seen flitting over them and carrying the pollen dust from flower to flower.

## The Kingfisher

Of all British birds few are more gaudy than the Kingfisher. Truly is he well called "the rival of the rainbow"! Of the seven colours of the spectrum he can claim four. He has a blue streak along his back, a black bill, green crown and wings, a lovely blue tail, white chin and throat, and copper-coloured breast. The beak of the male bird is long and well adapted for fishing, but that of the female is rather shorter.

If you were fortunate enough to see him on your Nature rambles he would present an interesting sight, especially if you caught him in the act of eating a small fish. You would see him perched on the branch holding the fish in his beak.

He would give it three or four smart whacks on the side of the branch and then gulp it down head first.

His nest is generally built in a deserted rat-hole. It is invariably lined with fish bones—the remains of his food. The female lays seven white, oval eggs.

## Moths and Butterflies

It is only natural that the majority of us should find the moths and butterflies more interesting than other varieties of insect, with the possible exception of the gaudy and resplendent dragon-fly. While many of the smaller, less conspicuous, and less attractive insects are really more wonderful in habits and in anatomy, the size and bright colour of the butterflies make them objects of admiration to us from the days of our infancy.

The butterfly has been called a winged blossom. George MacDonald wrote of it:

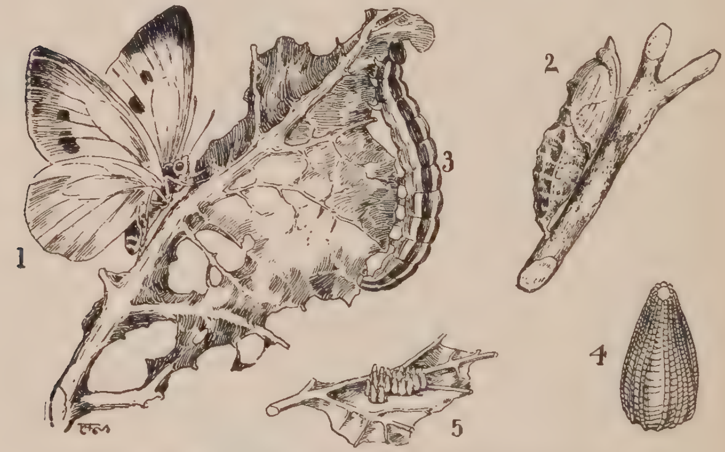
> "The butterfly flits like a stray thocht o' God".

If the reader is fortunate enough to possess a microscope, the interest and profit of his studies will of course be almost infinitely increased, particularly where the more minute members of the insect world are concerned. The eggs of the moths and butterflies, the change of these into caterpillars, the metamorphosis of the caterpillar into the chrysalis, and of the chrysalis into the butterfly, all reveal unexpected wonders under microscopic scrutiny.

Perhaps the common **Cabbage Butterfly** will be the best specimen with which to begin, as it is the commonest of the species. Note the wise provision in Nature whereby the eggs are laid on the food plants of the grubs. Try to picture the helpless grub—an orphan, for its mother invariably dies after performing her sole work of egg-laying—finding itself on the leaf of some tree of which it cannot eat, or being laid on the bare ground, dying of starvation. Thus the Cabbage Butterfly lays her eggs on the Cabbage; the Orange Tip on the Cuckoo Flower; the Tortoiseshell on the

Elm or Nettle; the Red Admiral on the Dead Nettle; most of the Fritillaries on the Violet, and so on. Thus, on whatever plant the insect feeds, there does it lay its eggs, for the creature's offspring naturally wants the same kind of food as its parent.

It would be highly interesting to hatch the eggs in the house, and, though experience proves that to carry this out successfully is by no means so easy as one would imagine, the experiment is well worth attempting. It would certainly be most deeply interesting to be able to watch, on your own table, the tiny grubs gnawing their way out of the shell.



1, Cabbage Butterfly. 2, Chrysalis or Pupa. 3, Caterpillar or Larva. 4, Eggs on back of Leaf. 5, Egg (magnified).

Interested readers can, at any rate, watch the hatching of butterfly eggs in their own gardens, preferably during the summer months, for then the eggs hatch quicker. Eggs laid in autumn are not hatched until the following spring, while those laid in February or March do not change into caterpillars until late in the year.

How very ravenous are the young caterpillars! Entomologists inform us that they consume between three and four times their own weight in food during the first twenty-four hours of their existence. Compare this with the average boy eating *once* his own weight even in fifty times the length of time. Think of their successive moultings, and note the necessity of this. Compare with other creatures that moult, as the Python, &c., each successive coat of which is frequently of a different colour from that of its predecessor. Note that they appear sickly and go off their appetite at moulting time. It is a trouble to them, and disorganizes their systems. Compare the moulting with skin peeling from the human body after scarlet fever, &c.

With the help of a miscroscope you could count the thirteen segments of the caterpillar's body, or, rather, twelve segments and the head. There are three pairs of legs, attached to the second, third, and fourth segments, with a large number of claspers around the spinnerets in the lower sections.

All the caterpillars, whether of butterflies or moths, are capable of spinning. We are apt to associate only the silkworm with spinning. It is strange the uses to which they put their spinning functions. While busy on the leaf of an elm a caterpillar may be dislodged by a gust of wind and fall towards the ground. It at once commences spinning, and thus, on its improvised tight-rope, gently lowers itself to the ground, of course returning by its thread of silk when it thinks danger is past.

The caterpillar is also able to construct a cosy nest for itself and its pupa, as well as to protect itself from its numerous enemies.

The legs of the caterpillar are splendidly adapted for it to climb by. The three pairs in the front of its body are formed with a sharply curved claw, which enables the creature to cling to the rope. The back legs have a sucker-like arrangement which forms a vacuum. Thus it elevates itself by its claws, and secures a firm footing by its sucker-like back feet, which act as a brake to its descent.

Readers should of course make a point of looking for pupæ in every likely place, and perhaps take specimens home.

It is strange to see the places where the various caterpillars crawl. Some roll themselves in leaves, especially many of the moth caterpillars; others are found under an old brick wall mixed with the dry mortar; while a few others may be seen suspended by a silken thread from the twigs of the currant bush, &c. I could nearly always find pupæ under the roots of a spurge laurel. This shrub stood by the wall of my house, and the roots were always surrounded with dry earth. Pupæ of many varieties seemed to have a great liking for the dried leaves and mould, and I have frequently seen, towards autumn, quite a dozen of these silken balls.

It has been conclusively proved by experiment that the length of time an insect remains in its pupal stage depends entirely on the temperature. Pupæ kept at an artificial heat of 80° F. and 120° F. respectively show this. Those at the latter figure unfold much sooner than the others. There is no reason why we should not watch various pupæ unfold in our own house. Keep one or two in the corner of the cupboard. If you are successful, the observation of the gradual development of the wings and the slipping of the containing shell, will well repay you by the great entertainment which will be afforded you. The cocoon will be seen to change colour slightly, and the case will become nearly transparent. When these changes are first noticed, it would be as well to place the cocoon by the side of a twig, for, be it the dragonfly, butterfly, moth, or any other insect emerging from the pupal stage, most surely will it want to climb. The reason is that the instinct of pupæ—if we may use the term in connection with insects—tells them that they must climb to reach the bright sunlight, where they will be able to dry their clammy bodies, and make their wings crisp and brittle, so that they may expand them to the fullest extent.

Thus the cycle is completed, to be again continued. First the butterfly laying the eggs; next the grub or larva; after this the pupa in its silken cocoon; and, finally, the butterfly again. I have never yet known any lover of Nature who was not fascinated by the study of this cycle.

The next point is to note the distinctions between butterflies and moths, for there are many which are not generally known. Such questions as "When do you see moths flying about?" "How do butterflies arrange their wings when they are at rest?" "Which are the gayest creatures?" and so on, will cause the readers to look about them, and thus they will build up the table of distinctions, step by step, simply on the results of their faculty of keen observation.

Briefly tabulated the chief distinctions are:

| *Moths* | *Butterflies* |
|---|---|
| Generally seen in the evening, and rarely emerge before twilight. | Seen in the noonday sun, and never seen late in the evening. |
| As a rule they are rather dingy. | Most of them have brilliant plumage. |
| The "feelers" taper to a point. | The "feelers" end in knobs. |
| When at rest they fold their wings over their bodies, wrapping themselves up, as it were, with them. | Invariably raise their wings over their backs, and fold them together in a vertical direction. |
| Curve their feelers downwards, under the head and chest. | The stiffness of their feelers prevents this. |

There are still other distinctions, but these will be quite enough for the reader to remember. There is no reason why every one of these points should not be noted by actual observation. Even quite young children observe closely enough to tell us that the wings of the butterfly are "upright" when it rests on a flower; that moths come out in the evening, and so on.

Finally, we must deal with some of the most important kinds of Butterflies and Moths, and note their characteristics. Out of the sixty kinds of Butterflies common to this country, the following half-dozen would be sufficient at first: Red Admiral, Purple Emperor, Large Tortoisehell, Large White or Cabbage Butterfly, Orange Tip, and one of the Skippers. These are common in all parts of England, and you will undoubtedly be able to secure specimens of most of them during the summer.

Of the eighteen hundred species of Moths found in the British Isles, the best half-dozen to select are: Hawk Moth (including the Death's Head and Eyed varieties), Goat Moth (one of the largest we have), Tiger Moth (celebrated for its beautiful colours), Burnet-moth (seen resting on the stem of a thistle or vetch during dull days), and the Tineæ or Leaf-rollers. Space will not allow me to give a detailed description of each of these, but they will be readily recognized from an ordinary chart of British Moths. Do not, however, begin by studying the chart and then hunt for particular butterflies. Use it rather to identify those which you have observed.

## The Dragon-Fly

Our first subject in this month related to the king of birds so far as beauty of colour is concerned, and the Dragon-fly must certainly be crowned in the insect world. Vivid green, red, and blue colours deck his spindle-shaped body, and his beautiful gauzy wings as well. Like the Fly (see p. 159) he has some wonderful eye-cases. Each composite eye is said to consist of ten thousand separate eyes. (I need not recall to you how difficult it is to catch one when it is sitting on the rushes close by.) He has six legs.

The metamorphosis of the Dragon-fly is very similar to that of his relative, the Caddis-fly (see p. 115). He crawls from his larva case at the bottom of the pond about April or early May, and fastens on to the stem of a plant just above the surface of the water. At first he is without wings, and he is rather ungainly in build. Soon his skin splits, and very slowly his head emerges, soon followed by his legs and four flabby wings. The sun speedily dries the wings, and in a few hours they take on their familiar gauzy appearance. When they are fully developed he is able to fly over sixty miles an hour, or faster than an express train.

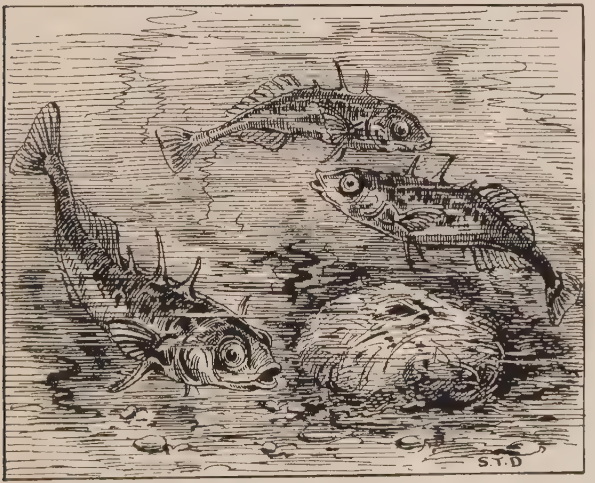
The wings are attached to his body by very strong muscles, so arranged that he can fly upwards, downwards, or sideways without turning his head. The Dragon-fly darting about in the sun gives a marvellous display of aeronautics!

He has a very hard underlip, which enables him to tear the insects which he catches into very small pieces.

You may sometimes see a desperate encounter between Dragon-fly and Swallow, for the latter looks upon him as a dainty titbit. Both creatures are the swiftest of their kinds, but the dragon-fly's smaller body enables him to escape by threading in among the rushes.

## The Stickleback

The "Tiddler", beloved of all schoolboys, certainly deserves a few sentences of description. Though one would imagine his appearance was well known, people frequently confuse him with the minnow or the gudgeon. If the reader has anything in the nature of an aquarium, he will find the Stickleback not altogether satisfactory as an inmate; for



Sticklebacks and Nest.

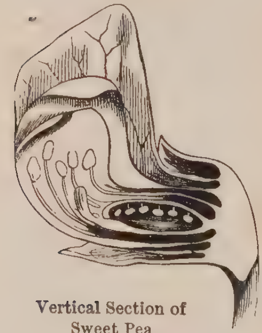
though he does not require to be kept in constantly running water, his pugnacity makes him rather troublesome.

The Stickleback is essentially a pond fish. It very rarely, indeed, frequents the river. It may be known by the three stiff spines along its back, its bright red belly, and its green eyes. The "tiddler" is the only fish which builds a nest. The nest is tubular, with open ends, and is composed of fine grasses and roots. It is a little larger than a small-sized plum.

The female lays a bunch of tiny white eggs in the nest, and leaves them to be hatched by the warmth of the sun. The male takes charge of the eggs, and keeps on "sentry-go" just outside the nest until they are hatched. If any other fish intrudes there is a terrible battle, as the tiddler is a desperate fighter. In about three weeks the young appear, and the father watches over them until they are able to take care of themselves. His bright colours now disappear, and he leads a quiet life till next spring.

## The Garden Pea

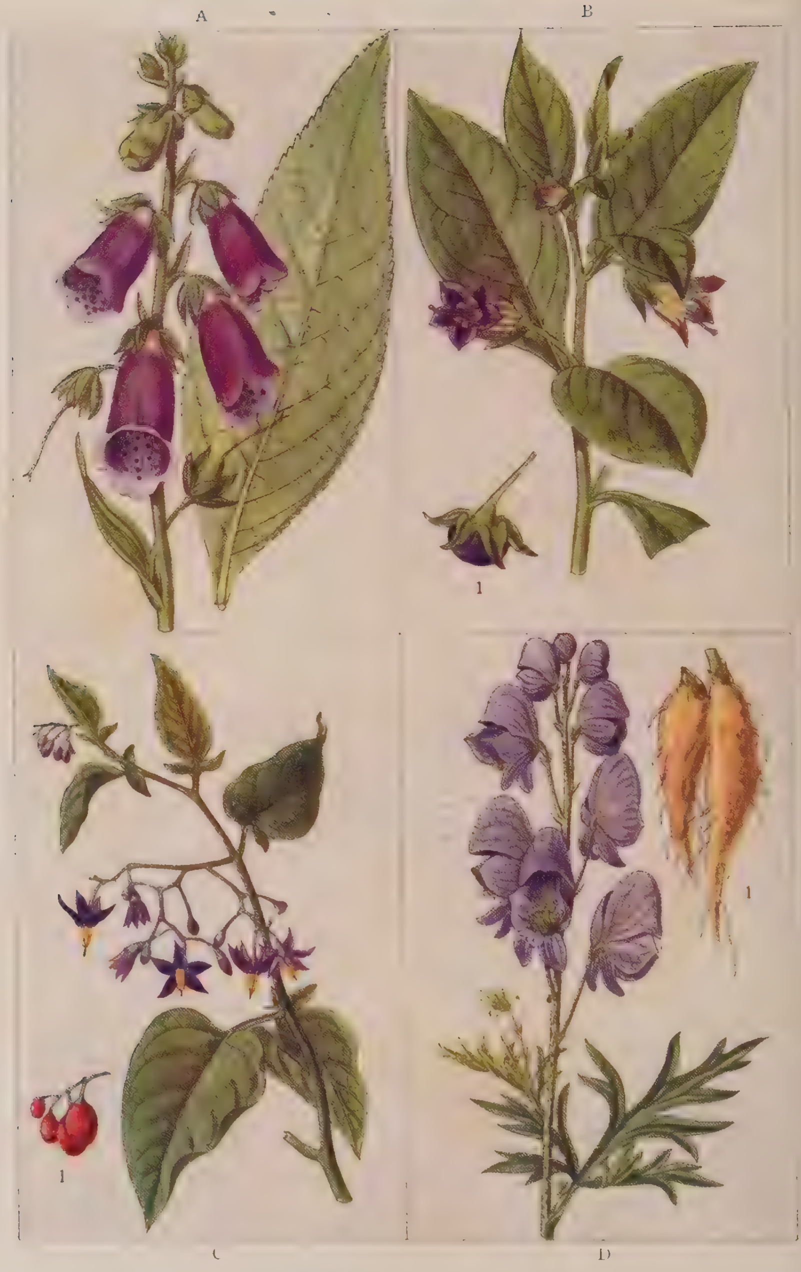
A great point in favour of the Garden Pea as a subject for study is the profusion of specimens obtainable. As in many cases the late flowers and the fully developed pods of earlier flowers are to be seen simultaneously, the observer has an excellent opportunity to compare the pea's development at various stages. For convenience you can easily keep a growing specimen in the house.



Vertical Section of Sweet Pea

The chapter on Climbing Plants (see p. 125) should be referred to. Note that the top leaves have changed into tendrils, just as certain leaves of some other plants assume various unusual forms. The reason why the plant climbs will, of course, be fully considered.

The blossom will now be dissected. In shape it resembles a butterfly. There



POISONOUS PLANTS—I

A, Foxglove. B, Deadly Nightshade (1, Berry). C, Woody Nightshade or Bittersweet (1, Berries). D, Monkshood (1, Roots).

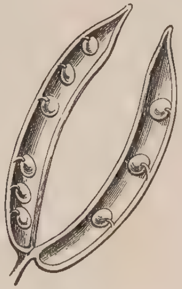
*Page* 150

are five sepals and five petals. The large upper one is the **standard**, the two side ones are the **wings**, and the lower pair the **keel**. Remember insect pollination, chiefly by the butterfly. Why does this insect specially frequent the pea flower? Because of the protection afforded it, as both are of almost the same shape.

The flower attracts many other insects, because of its beautiful light colours. Thus much cross-pollination follows, producing still more colours. As the petals die, the ovules change into seeds. The ovary containing the seeds rapidly develops into the pod or **legume**.

When the pod is split open the readers will see there are two perfectly formed valves containing the seeds, which we eat before they are fully matured. The point of junction of the seeds along the upper valve is the **placenta**.

The Sweet Pea also can easily be obtained, as these beautiful little flowers are now so popular. The seeds of the Sweet Pea are not so fine as those of its garden relative, but the blossom is much more variegated and gaudy.



Pod of Pea, showing Placenta

## The Wild Rose

If the weather be favourable we ought to have a good selection of Wild Roses—or Dog Roses, to give them their common name—in bloom this month.

This flower will, of course, be incorporated in the great and important Rose family, from which many of our best Fruits, as the blackberry, strawberry, raspberry, apple, plum, and cherry are derived. The reader will find it difficult to associate these popular fruits with roses, but an analysis of their various flowers, methods of pollination and fructification, will speedily convince him.

As, of course, every reader knows, the Wild Rose is found freely blooming on the hedgerows, and is often called a Brier. They will trace its strong roots and find numerous suckers. (What do we do with suckers of the Garden Rose? and why?)

The use of the thorns in climbing is referred to on p. 127. The leaves are net-veined and have a rather rough surface.

Wild Roses

The formation of the flowers is very important. They are found, as a rule, on the ends of the stem; thus they were formed from terminal buds (see p. 59). They must be very carefully compared with those of other members of the Rose family (see above). It will be found that they each have five petals quite distinct from one another. These lie on five sepals, which are the leaves forming the calyx. These leaves are divided and slightly turned back. There are very many hairs on them, thus preventing insects from crawling up into the cup-shaped flower in search of nectar.

The colour of the petals varies according to the age of the flowers in some cases, and in others owing to cross-pollination. As a rule they are of a beautiful and delicate white, tinged with pink, and sometimes they appear as a very deep blush. These delicate, though bright hues are a great attraction to insects. It would be a difficult task to count the

Strawberry: Flowers and Fruit

stamens, as they are very numerous. Each one is surmounted by an anther or dust-box, and they all stand up in the open cup, or **thalamus** as it is called.

It is rather a good thing that the flower advertises itself to insect life so admirably, for it secretes no nectar, as many flowers do. Fertilizing insects are, therefore, rather disappointed when they fly to the flowers in hundreds, naturally anticipating rich stores of honey from such alluring cups. There is an abundance of pollen, and so the bees, &c., do not go away quite "empty-handed".

It would be well to analyse some of the flowers of the Rose family, noting their differences and similarities. The **Strawberry flower** has the same number of petals and sepals, and innumerable stamens, but there is no deep calyx, or cup. The ovaries are placed on a little mound inside the sepals, rather than in a depression as in the Rose. In time this mound will become greatly enlarged, and the tiny seeds will be buried in it. We shall ultimately see the mound as the beautiful ripe fruit.

The **Blackberry**, too, is similar, and also different from them both. There are the five petals, five sepals, and countless stamens, and, like the Strawberry, the seed-boxes grow on a mound. But, unlike the Strawberry, this mound does not grow larger. The **seed-boxes** enlarge and ripen into little globes of juicy pulp, each containing one seed. These fruits are called **drupes** (see p. 17).

The flowers, mounds, depressions, &c., of the Apple, Pear, Plum, and Raspberry flowers can be similarly examined at this time of the year, and by the method of continued observation their developments may be traced throughout the summer.

The fruit of the Wild Rose is the common "hip".

*Nature Study for the Month:*

1. Butterflies.
2. Moths.
3. The Kingfisher.
4. The Dragon-fly.
5. The Stickleback.
6. The Garden Pea.
7. The Wild Rose.
8. Members of the Rose family.

*Flowers of the Month:* Foxglove, Corn Crowfoot, Poppy, Dog Rose, Pea, Snapdragon, Forget-me-not, Flowering Rush, Self-heal, Borage, Yarrow, Dwarf Mallow, Privet, Lady's Slipper, Sainfoin, Silver-weed, Sow-thistle, Pink Campion, Crane's Bill, Field Convolvulus, Scarlet Pimpernel, Bee Orchis, Meadow Vetchling, Honeysuckle, Twayblade, Spiderwort, Buxbaum's Speedwell, Bulbous Crowfoot, Thyme, Water Lily, Chamomile, Celandine, and St. John's Wort.

Everywhere about us they are glowing,
Some like stars to tell us Spring is born;
Others, their blue eyes with tears o'erflowing,
Stand like Ruth amid the golden corn;
Not alone in meadows and green alleys,
On the mountain top and by the brink
Of sequestered pools in woodland valleys,
Where the slaves of Nature stoop to drink.
In all places, then, and in all seasons,
Flowers expand their light and soul-like wings;
Teaching us by most persuasive reasons
How akin they are to human things.
And with child-like credulous affection
We behold their tender buds expand;
Emblems of our own great resurrection,
Emblems of the bright and better land.

The beautiful thoughts underlying this stanza are well worth every reader's attention. July is essentially a month of flowers. Whether we go to garden or common, heath or woodland, mountain or pond, we may find flowers everywhere. Traveller's joy, burdock, and teasel line the hedgerows. Innumerable specimens clothe the garden. But with all this, strange to say, July is not the best month, or even a good month, to study flowers. The formation of most of them is much better considered in May and June, when their petals have first unfolded. A far better plan this month is to take a *class* of plants, such as Medicinal plants or Poisonous plants. The latter kind should certainly form one of this month's studies, so that the enthusiastic reader may be warned against rash holiday experiments.

Insect life is in full activity, and those readers who give prominence to this branch of Nature Study have much material to hand. Ants and the Common House-fly may be suitably studied, and I have therefore included them in this month's descriptions.

Many specimens of pond-weeds and pond fish may be obtained for the aquarium. A word of warning! Do not go away from home for your holiday and in the bustle forget to arrange for proper care to be taken of the specimens it contains. Sometimes people who would never dream of neglecting a dog or a cat, in these circumstances, will forget to provide for the more helpless living things for which they are responsible. Unless you are prepared to take some trouble with it, do not keep an aquarium at all.

## Poisonous Plants

These include the Foxglove, Deadly Nightshade, Woody Nightshade, Bryony, Henbane, Hemlock, Yew, Meadow Saffron, Cuckoo-pint, Monkshood, and Fool's Parsley.

In the discussion of the properties of the flowers and berries, it will be seen that under the chemist's treatment many of them form valuable drugs. Youngsters, however, must be strictly warned that it is only by chemical treatment that they are useful; if *they* attempt to eat the berries or leaves, they will suffer from acute pain and may even lose their lives. At the same time the reader will see that there is a use for everything in Nature, and that, though these poisonous plants are to be shunned by us all, yet, under proper treatment, these very qualities may alleviate pain and suffering. The poet aptly says:

The Foxglove's leaves, with caution given,
Another proof of favouring Heaven
Will happily display:
The rapid pulse it can abate,
The hectic flush can moderate,
And, blest by Him whose will is fate,
May give a lengthened day.

(The Foxglove supplies us with a valuable medicine, extracted from the digitalin of the leaves, which is most useful as a sedative and narcotic in dropsy and sundry diseases of the heart.)

The **Deadly Nightshade** is found on the hedgerows and waste places. It belongs to the same family of plants as the potato, and its flower, which appears in May, is frequently mistaken for the potato flower. The plant grows to a height of four or five feet. Its leaves are egg-shaped and of a dull-green colour. In August and September the flowers are succeeded by a large black berry about the size of a small cherry. In general appearance the berry greatly resembles that of the common black cherry, and some children have eaten it on this account. The plant is frequently called **Belladonna** (Italian, *bella donna,* fair lady), because a valuable juice is extracted from the berries called belladonna. This juice when applied to the eyes causes the pupils to sparkle and dilate. Thus many ladies, especially actresses, frequently apply the belladonna to their eyes, although constant application is most injurious. The juice is also often used as a cosmetic. In nervous ailments doctors sometimes prescribe a mixture of belladonna, as it has narcotic tendencies.

The **Woody Nightshade,** or **Bittersweet,** can easily be distinguished from the former variety by its small red berries, much resembling red currants. The plant is a climber, and may generally be found clinging to the trunk of a tree in waste places. It has heart-shaped leaves which have an unpleasant odour. Its tiny purple flowers, which appear in July, are conical in shape, and they are generally seen hanging from the branches in a drooping position. The berries are not so deadly as those of the Deadly Nightshade, but they should certainly be left alone. As they appear in the same places as the hips, haws, sloes, and other fruits, there is a great temptation to children to pluck and eat them.

The **Monkshood,** or **Aconite,** derives its name from the arrangement of its petals, which are in the form of a monk's hood. It is a rather pretty plant, and may often be found in gardens. It is a member of the Buttercup family. The root is very poisonous, and some people have dug it up in the winter time for horse-radish root. A medicine called **aconitine** is extracted from the Monkshood, and this suggests its second name, Aconite. The medicine is very valuable in neuralgic ailments. A still further name for the plant is **Wolf's Bane**, because it was much used in olden times as a bait and poison for wolves.

**Henbane.** Referring to the wolf's bane reminds us of the hen's bane (examine the word "bane"). It is a rather coarse shrub, which grows in the dry soil of waste ground. It has hairy stems and leaves which give out a disagreeable scent. Its flowers are trumpet-shaped, with a yellowish-brown colour and purple veins. The juice of the leaves and seeds is made into a medicine with narcotic properties. Hens eating its leaves would soon die, and a small dose of the compressed juice would prove fatal to man.

**Hemlock.** This plant is scattered about all over the country. It is tall and erect, and somewhat resembles parsley. Its stem is shining and smooth, and if it be squeezed a milky fluid will exude. The leaves have a disagreeable scent, very similar to that left behind by a mouse. Its tiny green fruit follows the rather large clusters of white flowers. The fruit and leaves are fatal to oxen, but it is said that other animals, as the horse and sheep, can browse on it with safety. Should man eat them he would probably be afflicted with convulsions and paralytic fits. Chemists and doctors frequently use the medicinal extract as a substitute for opium. (The chief characteristics of these narcotic drugs should be understood.) The poison by which Socrates was put to death is said to have largely consisted of extract of hemlock.

**Fool's Parsley** much resembles the edible parsley of the garden. It is a common weed, but often grows in the garden, and on that account may be mistaken for the true variety. The chief distinction lies in the obnoxious scent of the Fool's Parsley, and the pleasant scent of the other kind. We ought, perhaps, not to class this among the poisonous plants, for no authentic cases of effects usually following poisoning have been known. Nevertheless it is commonly believed to be poisonous, and it would be most unwise to eat it.

The **Foxglove** is one of the most beautiful of our wild flowers, and for that reason it has been transferred to cultivated ground. Its flowers resemble the finger of a glove in shape, and on their insides there are velvety purple and white markings. The name is said to be derived from "folk's" glove or "fairies'" glove. (Folks and fairies were little people or elves who were supposed to live in the forests —see Shakespeare's "Midsummer-Night's Dream" for description of these tiny creatures.) (For its medicinal properties see p. 151.)

The **Common Bryony** is a climber, and may be found in most hedgerows along country lanes. The leaves are rather large and light-coloured. Its red berries are highly poisonous. From the thick root a medicine has been extracted which is valuable as an emetic.

The **Meadow Saffron,** or **Autumn Crocus,** is common in pasture lands. It has its alternative name owing to its flower, which resembles a crocus in shape. The flower is of a reddish colour. Cattle are frequently poisoned by inadvertently browsing on it.

The poisonous properties of the **Cuckoo-pint** and **Yew** and **Laurel** berries have been referred to in previous chapters.

Everyone ought to know of a few antidotes to those poisons, and to be aware of the great value of mustard and water as an emetic where suspected poisons have been swallowed.

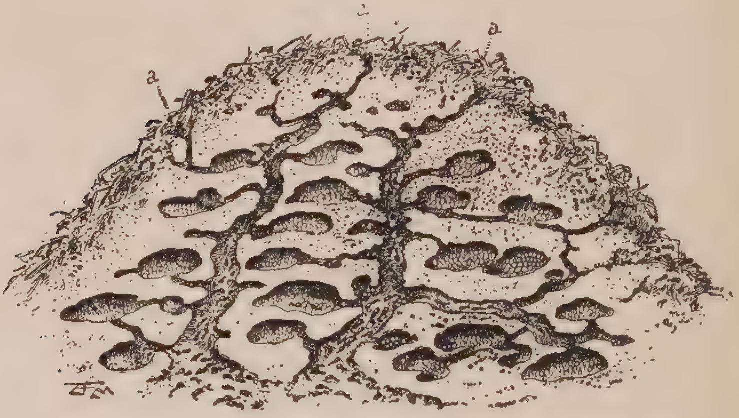
## Ants and their Ways

No creature, large or small, has excited the interest of Nature Students more keenly than that tiny creature the Ant. It has been credited, rightly or wrongly, with reasoning powers of a high order, and seems certainly to have a wonderful gift for organization and a talent for hard work.

Proverbially the Ant is typical of foresight and of industry.

"Go to the ant, thou sluggard," says Scripture; "consider her ways, and be wise;" while an Arab proverb advises mankind to "be like the ant in the days of summer". The Roman poet Horace, too, pays tribute to its wisdom and thriftiness: "The tiny ant, a creature of great industry, drags with her mouth whatever she can, and adds it to the heap which she is piling up, not unaware nor careless of the future".

Naturalists and writers have devoted a particular amount of attention to the study of the Ant, and I recommend my readers to take the first opportunity of enjoying what, for instance, Henri Fabre and Lord Avebury, each in his own fascinating way, have written of their experiments, observations, and conclusions.

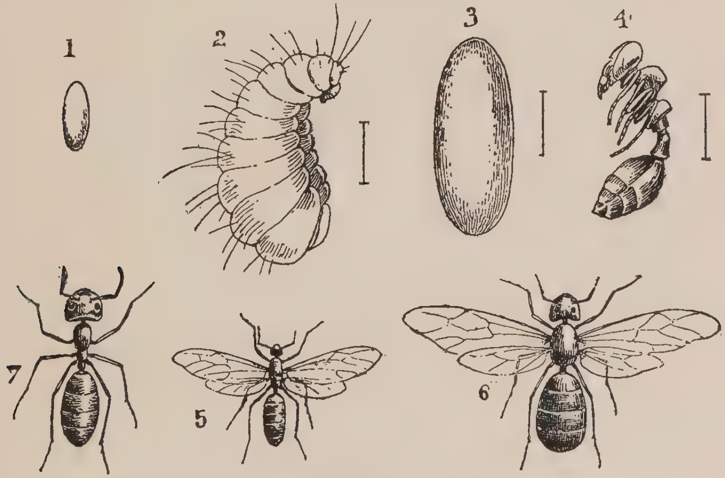


Section of Wood-ant's Nest, showing passages and chambers containing eggs.
*a a a*, Entrances to nest.

For those who live in the country, or have chances to make country excursions, opportunities are not lacking for individual observation. Ant-hills, which contain the nests, are common objects in our woods, and may be examined by anyone, and even with the naked eye some idea can be obtained of their structure, and carrying-parties watched at work.

The Ant undergoes precisely the same metamorphoses as the Butterfly; that is, first the egg, secondly the larva, thirdly the pupa, and finally, the perfect insect. It is estimated that a single queen ant will lay between four and five thousand eggs at a time, and that the White Ant deposits over eighty thousand eggs a day.

It takes three or four weeks under favourable conditions to hatch the eggs. When the grub appears it is much like a caterpillar, but it is smaller, and, as a contrast to the butterfly larva, it is quite helpless. It is well cared for, though. An ant's colony is a model of law and order. In the community there may be found nurses, doctors, soldiers, scavengers, milkmaids, architects, and so on. When the helpless grub first appears in the world the nurses carefully attend to it, and if it be at all sickly they will carry it to the surface of the nest for a sun-bath. They also wash it, for these tiny insects are most cleanly in their habits. Each nurse seems to have a certain number of babies to watch over, and it has sole charge of them for about five or six weeks until they are able to look after themselves.



The Wood-ant.

1, Egg (magnified). 2, Larva. 3, Cocoon made of fine white silk. 4, Young ant, taken out of cocoon. (2, 3, 4. The lines show average natural sizes.) 5, Male ant. 6, Female ant. 7, Worker ant.

The **chrysalis** is made in much the same manner as that of the butterfly larva (see p. 138). After about six weeks the perfect insect emerges from the cocoon. The reader will find it an excellent plan to make a few sketches of the ant from life. Nothing will so impress upon his mind the structure of the creature, with its three distinct parts—head, thorax, abdomen—and its three pairs of legs and two antennæ.

It is worth while also to draw, either from personal observation or from a picture, a detailed section of an ants' nest, showing its roads, intersecting galleries, nurseries, central chamber, and so on. Lying near the surface of the ant-hill are generally some blades of grass, on which live the aphides or "ant cows". These "cows" are regularly milked by the ants, who carry the nectar to the babies and invalids of the nest. In a complete colony there are three kinds of ants—(1) the queens, (2) workers, (3) males. The queens originally possess wings, but before laying their eggs they tear them off, and are never seen outside their nests again. Some queens live for a considerable time. Lord Avebury—to whom we are indebted more than to any other writer for our knowledge of ants—possessed a queen which lived for fourteen years, and laid millions of eggs.

The workers include all the different occupations I have previously mentioned. They are the barren females, and are known as **neuters.** Like the queen they have no wings, but they are born wingless, whereas we saw that the queen discarded her wings after her "nuptial flight". The workers perform all the necessary work of the community.

The males do not live long. After the queens have settled down to lay their eggs the males die. If they are too long making up their minds about it, the neuters turn them out of the hive. Should they, or any of the grubs, die inside the nest, the undertakers seize them with their legs and antennæ and drag them to the ant cemetery.

A discussion has lately been taking place as to whether ants have the power to reason. The controversy originated by Mr. Henry Hill, in a lecture at the London Institution,

Ants returning after a Battle bearing the Spoils of Victory

declaring that "ants have no higher quality than that of instinct". Lord Avebury, however, believed that they do "think". In his book on "Ants" he tells us: "When we see an anthill, tenanted by thousands of industrious inhabitants

Ants carrying Aphides into their Nests for Household Use

excavating chambers, forming tunnels, making roads, guarding their home, gathering food, feeding the young, tending their domestic animals, each one fulfilling its duties industriously and without confusion, it is difficult altogether to deny to them the gift of reason, and the preceding observations tend to confirm the opinion that their mental powers differ from those of men not so much in kind as in degree".

In proof of this "reasoning" capacity his lordship gives the result of a wonderful experiment. He intoxicated about eighty ants and placed them near one of his ant nests. Half were friends or members of the community, the other half were total strangers. Soon the nurses came out, and, of the friends, twenty-seven were taken into the nest and carefully tended, seven were drowned in the surrounding ditch, and six were left alone. Of the strangers, thirty were dropped into the ditch, one left alone, and nine removed to the nest. If this experiment does not conclusively prove that the ant possesses the faculty to reason, then its sense of instinct must be developed to an extraordinary degree.

Then, again, they show remarkable prudence in the way they manage their aphides or "cows". They carefully tend the eggs of the "cow"; they nurse the grubs, and bestow as much care on them as though they were their own offspring. When the grubs are fully developed they take them to the "cow-sheds" near the daisy roots, and then they regularly milk them.

# The Common House-fly

Only too many specimens are likely to be available for the reader's study of the Common House-fly, for in spite of all destructive measures it continues to flourish and abound wherever man himself takes up his abode.

Nine people out of ten, having taken little notice of flies except to try to destroy them, think that House-flies are all alike. There are, however, three distinct varieties.

Two of the three varieties—the Common House-fly and the Bluebottle (or Blow-fly)—do not "bite" in the strict sense of the word. In appearance they have brilliant red eyes, enclosed in exquisite silvery settings. They have a bluish colour tinged with purple. Their trunks are slightly curved in front, and their "bite" is the result of their efforts to extract a drop of moisture from the sweat-glands of the human skin.

The third member, however, is of a different character. The boys could call him the "Pointed-mouthed Stinger". He is of about the same size and general appearance as the common house-fly. Examined under a microscope his trunk sticks out from his head like a short dagger. His colours are duller and his eyes less fiery than those of his companions. Most of the sharp "bites" which we endure come from this evil little creature, who is closely akin to the tsetse fly of Africa. He is not as commonly found in houses as the other two.

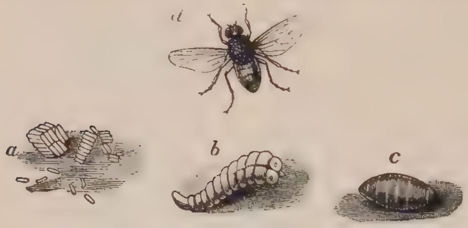
The humming sound of the House-fly is caused by the vibration of the insect's wings. It is calculated that this takes place nearly six hundred times a second. (Readers must not confuse the cause of the "hum" of the House-fly with that of the Bluebottle. The latter makes its "buzz" with its breathing apparatus.)

The fly never increases in size after it has emerged from the larval stage. Like the ant, it does all its growing in the cocoon.

Readers may wonder how a fly is able to run up a sheet of glass or to walk in an inverted position along the ceiling.

The reason is that the pad of the fly's foot has twelve hundred hairs, each of which exudes a gummy fluid. There are two pads on each foot, thus making a dozen in all. The fly, therefore, *sticks* to the surface, and when it lifts its feet, it does it in much the same manner that we pull a postage stamp from a letter after we have soaked it in water.

Have you noticed in what position a fly rests on the wall?

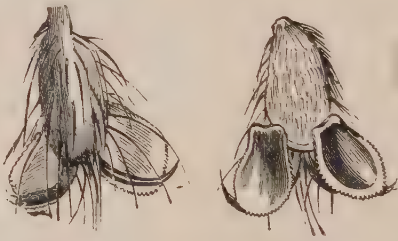


Metamorphoses of a Fly

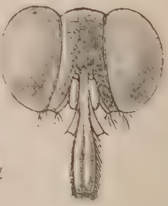
*a*, Eggs. *b*, Larva or maggot. *c*, Chrysalis. *d*, Perfect fly

Head of the Fly, with mouth extended, seen from above

Extremity of the Sucker of the Fly, showing its annulated appearance



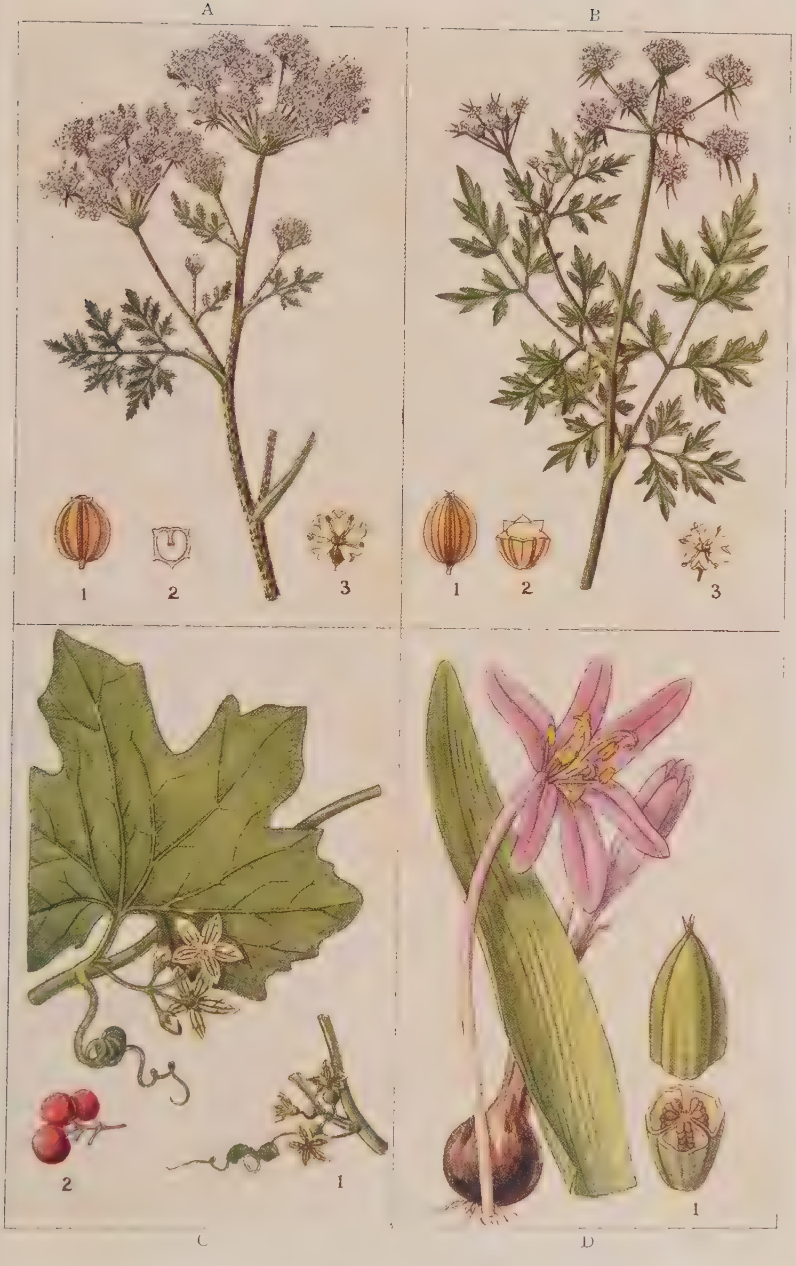
Upper and Lower Sides of a Fly's Foot



Compound Eyes of the Fly

You may not have noticed that it is always seen with its head downwards, and that it always walks *up* a window and never downwards.

Mr. Henry Hill, to whom I have before referred, in a lecture to children at the London Institution, told his audience that though the horse could move a weight three times as heavy as itself, a fly can move sixty or seventy times its own weight. He also said that the compound eye was composed of two thousand facets, about which there was a diversity of opinion. Some investigators prefer the "mosaic" theory, which states that a fly can see only one part of an object with



POISONOUS PLANTS II

A, Hemlock: 1, Fruit; 2, Cross section of Fruit; 3, Flower. B, Fool's Parsley: 1, Fruit; 2, Fruit, cut across; 3, Flower. C, Common Bryony, male: 1, Female Flowers; 2, Berries. D, Meadow Saffron: 1, Capsule, cut across.

*Page* .

each facet, while the other theory argues that the insect can see the whole of the object with each facet.

Whichever of these theories is correct, the fly has wonderful eyes, and the compound eyes are really "boxes" which enclose thousands of smaller eyes. Thus the fly is able to see in every direction at once. Remember the difficulty one has in catching a fly, whether approaching it towards its head or otherwise.

## The Snake and Viper

The heading of this section would lead one to conclude that the Viper is not a snake, but we generally speak of the Common or Grass Snake as quite distinct from the Viper. These two are practically the only specimens found in this country, but in some districts a Smooth Snake is sometimes found.

Go over in your mind the chief distinctions between the forms of reptiles and other members of the animal kingdom. The body is extremely lithe and the joints are very numerous. Remember the absence of limbs, and note the manner in which the snake moves by the help of its ribs. Compare this movement with that of the slug (see p. 91).

The **Grass** or **Ringed Snake** is much like a large green worm possessing black spots and a yellowish neck, and it is about a yard long. It lives in marshy districts, and glides very quickly through the grass. Its teeth are small and point towards its throat. This valve-like arrangement prevents the frogs, mice, &c., escaping when the snake has drawn them into its throat, as it swallows its prey whole. The tongue is thin and forked. (Very many people think that these are the poison fangs. On my visits to the Reptile House, at the Zoological Gardens, I have seen children, and even adults, shudder when the snakes have put out their tongues, as the onlookers invariably supposed these to be the dreaded poison fangs. All snakes have forked tongues, whether poisonous or not.)

The snake's sight is rather feeble, but it has a keen scent. (For the apparent absence of eyelids and the fact that it seems to sleep with its eyes open, see p. 49.)

Let me recall to the reader the extraordinary case of one snake swallowing another, which occurred at the Zoo about six or seven years ago. Two pythons were fed every morning with pigeons or other birds. These they simply took into their mouths and swallowed them whole. One python, evidently very hungry, had finished his meal, and darted at the tail of the other pigeon which was sticking out of the second python's mouth. He gradually drew this tail into his own mouth, and the other snake's head with it. Little by little the complete snake, about 20 feet in length, was drawn into the other creature's body. The python was in

Grass Snake

Adder

evident agony. It remained quite still, and its scales were greatly distended. On the second day it died, after having attracted thousands of people to see this marvellous sight. When its body was dissected, the swallowed snake was dead.

The snake comes from eggs, generally laid on a dunghill. They number about a score, and are fastened together by a tough membrane. The heat from the dunghill assists the eggs to hatch.

Snake's Eggs

(For the snake as a hibernator see p. 49.)

Everyone should know the distinctions between a Viper and a Grass Snake, as the bite of the former is dangerous. It, however, is not deadly, but it has a rather worse effect than a bad wasp's sting. Should anyone be accidentally bitten, he ought to suck the wound, if it be in an accessible position. Ammonia, well rubbed in, is a good antidote.

The chief distinctions between the two snakes are:—

1. The Grass Snake is much larger than the Viper. (The former is seldom less than 22 inches, and the latter is seldom more.)
2. The Grass Snake is of a light brownish-grey colour with a greenish tinge; the Viper has a zigzag black line right down the middle of its body.
3. The under part of the Grass Snake's body exactly resembles lead in colour, surmounted with black spots; this is absent in the Viper's body.
4. The head of the Grass Snake is more pointed than that of the Viper—the latter has a hammer-shaped head.
5. There is a faint V-shaped mark on the Viper's head which does not exist on the head of the Grass Snake.

I have purposely included the V-shaped mark last, because people will tell you this is the only way in which the two snakes can be distinguished. As a matter of fact there is the greatest difficulty in distinguishing them at all by this mark, for when they are gliding through the grass the V is quite indistinguishable. Numbers 1 and 2 are what children should be warned to look out for.

Of course, the greatest distinction lies in the fact that the Viper has poison-fangs while the Grass Snake has none, but this distinction is not visible to the naked eye. The construction of these fangs may be explained. They are really hollow teeth fixed in the gums of the upper jaw. A tiny tube connects the base of the tooth with a small gland which contains the venom. When the snake bites, it plunges its fangs into the fleshy part of the victim's leg, as a rule. The glands are compressed, and a thin stream of venom flows down the fang into the wound, where it mixes with the victim's blood.

*Nature Study for the Month:*

1. Poisonous Plants.
2. Ants and their ways.
3. The Common House-fly.
4. The Grass or Ringed Snake.
5. The Viper.

*Flowers of the Month:* Roses, Marsh Mallow, Nodding Thistle, Broom Rape, Harebell, Agrimony, Feverfew, Purple Loosestrife, Leopard's Bane, Horehound, Yellow Melilot, Wild Valerian, Yellow Bedstraw, Burdock, Wall Pennywort, Scarlet Poppy, Teasel, Bilberry, Yellow Toad-flax, Water Violet, and Eyebright.

Behind the master walks, builds up the shocks,
And, conscious, glancing oft on every side
His sated eye, feels his heart heave with joy.
The gleaners spread around, and here and there,
Spike after spike, their scanty harvest pick.
Be not too narrow, husbandman! but fling
From the dull sheaf, with charitable stealth,
The liberal handful. Think, oh! think,
How good the God of harvest is to you,
Who pours abundance o'er your flowing fields
While these unhappy partners of your kind
Wide hover round you, like the fowls of heaven,
And ask their humble dole.

It is very doubtful if the poetry of spring itself is much more lovely than that of autumn. The latter season has inspired some of our most beautiful lyric and descriptive verse, much of it tinged with the reflective sadness due to the realization that autumnal glory is only the prelude to the dark and melancholy days of winter.

Let me quote from a poem by George Arnold:

Among the stubbled corn
The blithe quail pipes at morn,
The merry partridge drums in hidden places,
And glittering insects gleam
Above the reedy stream,
Where busy spiders spin their filmy laces.

At eve, cool shadows fall
Across the garden wall,
And on the clustered grapes to purple turning;
And pearly vapours lie
Along the eastern sky,
Where the broad harvest-moon is redly burning.

August seems the most suitable month in which to study the cornfields and the seashore. Let a mental picture of the harvest-field be the background to your thought. The golden grain ready to fall from its ripened glumes; that wonderful contrivance, the self-binder, at work, cutting it down; the labourers standing the sheaves upright and making "shocks" (why do they do this?); carting the "shocks" to the stackyard; the gleaning operations, and so on. All the world at harvest-time seems bright. Many of the reapers sing at their work:

I hear the creaking of the wain,
I hear the reaper's merry strain;
As each the needed part supplies
To form the grateful harmonies!

And then, when all is safely gathered in, "harvest-home" follows, when master and labourer meet on common ground over the festive board and celebrate the ingathering of the harvest.

The first object which suggests itself for study amongst all the wealth of autumn is an ear of corn, but with this the reader is presumed to be already familiar from continued observation through the year. Many people will say that corn does not flower. The individual flower is very small, but in a July field the mass appears a light-coloured sea of foam.

Wheat belongs to the Grass family; that is, it is a herb which has a hollow cylindrical stem, with alternate leaves, and flowers growing in spikelets. The reader will realize that hollow stems are stronger than solid ones by reference to hollow handle-bars of bicycles, &c., and there is also the further advantage that they are lighter. Notice how the corn struggles up to get to the sunlight. When the storms of wind and rain appear, especially if the corn be nearly full-grown, it will be beaten down and lie in a tangled mass on the ground. This is one of the worst things that can happen in the harvest fields. Even if the ears did ripen, which is extremely doubtful, the machines would not be able to cut the corn.

Take care to notice the blade-shaped, alternate leaves, and the parallel veins. (Compare with any other leaves where the veins are similar. Why does Nature arrange the veins in this manner in these long leaves?)

At the junction of the leaf with the stem there is a kind of sheath and an overlapping transparent scale, which adds strength to the junction and prevents the water from standing in the sheath and rotting it. This scale is called a *ligule*.

The roots are very long and fibrous. (Note that the tall stalks require firm roots, as there is much leverage by the wind.)

The flowers of the wheat would be more suitably studied in July. The feathery stigmas and drooping anthers can be traced, when it will be seen there are three of the latter. Pollination is effected chiefly by the wind, and the grain, or fruit, under the influence of warm rains, rapidly swells and ripens.

## Medicinal Plants

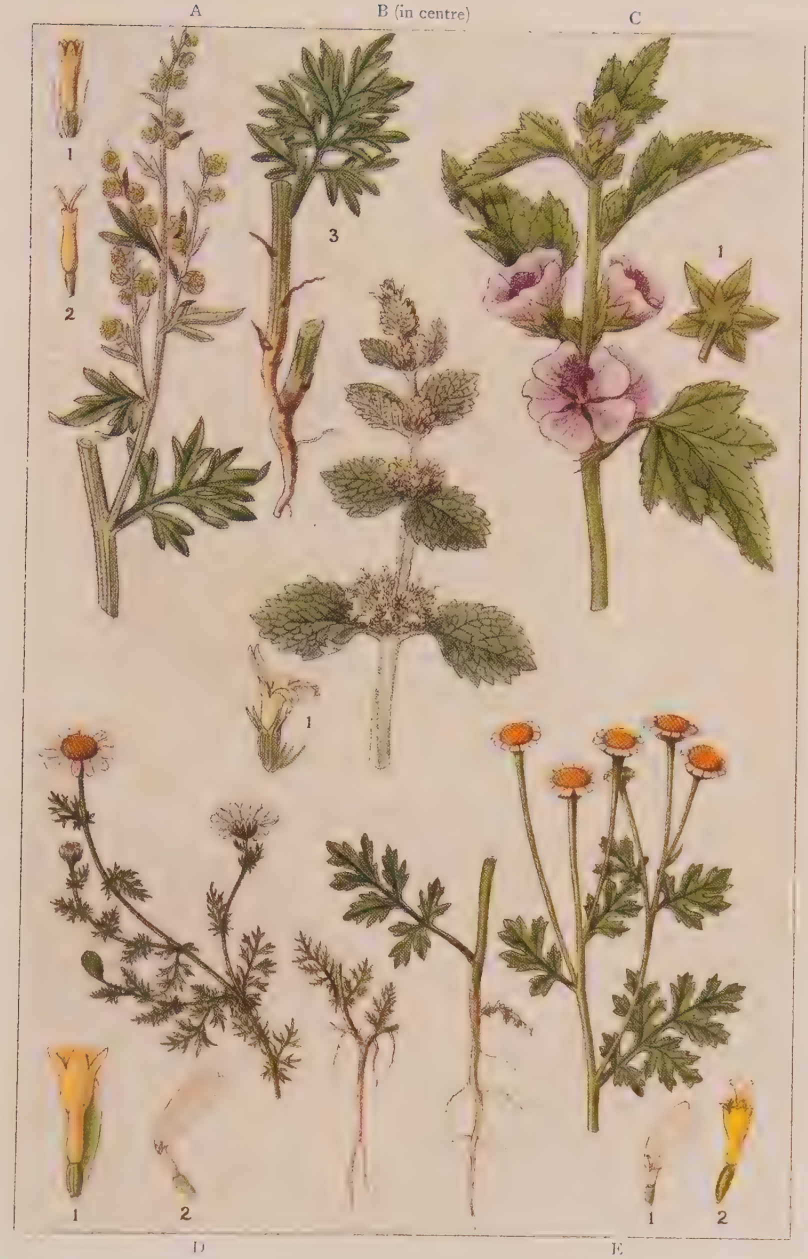
Strictly speaking many of the plants mentioned in the previous chapter, under the heading of "Poisonous Plants", should be included in this section because of their medicinal properties, but reference will be made to those herbs, &c., which are not poisonous, but which are especially used by the chemist in the preparation of drugs. All of them may not be in flower now, but it seems advisable to take them collectively, and the reader will remember to look for them when their season arrives.

Among the medicinal plants we may mention the Lavender, Peppermint, Chamomile, Marsh Mallow, Flax, Rue, Alder Buckthorn, Feverfew, Yarrow or Milfoil, Wormwood, Broom, Black and White Mustard, Henbane, &c.

The **Marsh Mallow** is found near the seashore. It has bluish flowers growing on a plant from three to four feet high. The plant is a hardy perennial, and its white flesh root is sometimes used in a similar manner to the root of the Horse-radish. The leaves and stem are covered with a soft down which gives the plant a hoary look, and the down also makes the leaves appear velvety to the touch. From the plant demulcent lozenges are made.

**Wormwood** is of course most familiar to everybody as being associated with bitter qualities. The plant is frequently associated with gall, and the two are often used as a figure of speech to indicate bitter despair. This plant belongs to a species from which the famous French absinthe is extracted. From the English or Common Wormwood we obtain a chemical extract noted for its extremely bitter qualities. For this reason it is often used for tonics, and sometimes in the preparation of wines, &c. Medicinally it is included in the composition of what are called worm-cakes, which are intended for the destruction of the tapeworm.

The **Feverfew** derives its name from the monkish word "febrifuga", which indicates that fevers fly away when



MEDICINAL PLANTS

A, Wormwood (1, Male floret; 2, Female floret; 3, Stem and root). B, White Horehound (1, Flower). C, Marsh Mallow (1, Calyx, double). D, Sweet Chamomile (1, Disc floret;

this plant is used. One of the old writers gave it marvellous properties: "Feverfew dryed and made into powder, and two drammes of it taken with honey, or other thing, purgeth by siege Melancholy; wherefore it is very good for such as have the giddinesse and turning in the head or swimming; for them that are purse or troubled with the shortnesse of winde, and for melancholique people, and such as be sadde and pensive and without speach. The greene leaves, with the flowers of feverfew stamped, is good to be layde to the dissease called the wilde fyre, or Saint Anthony's fyre".

The plant is a biennial, and may be found in waste places growing about two feet high. It has a thin, erect, and branching stem, and pinnate leaves of a hoary green colour. Its medicinal qualities have been fully described.

**Sweet Chamomile** blooms in the autumn. The field variety blooms earlier in the year, but it is not so much used now as in former years. The medicinal properties are contained in the petals of the daisy-like flowers. The colours of the petals are yellow and white. The wild chamomile is often found on grass lands with the daisy. The plant is a perennial and a very hardy grower. A chamomile field is a pretty sight when hundreds of thousands of the flowers are waving in the breeze. The leaves and flowers are very bitter and aromatic, the latter quality being due to the bluish oil of chamomile extracted from the plant and largely used by the druggist. They are also often used as poultices. Undoubtedly the chamomile is one of the best of our medicinal plants.

**Horehound** is often used in the mixture known as horehound beer. Extract of horehound is obtained from the white flowers and wrinkled greyish leaves. The stem and leaves have a hoary appearance. The flowers grow in crowded whorls at the junction of the leaves and stem. Horehound, besides being used in the manufacture of beer, is often taken for coughs and colds in the familiar form of "horehound tea".

**Peppermint** is the name of a plant, and also the famous extract or essence of peppermint. It is a herb, and certainly one of the most valuable we have. The stem of the plant is square, and the leaves opposite and simple. We recognize it by its aromatic odour. The garden mint belongs to the same family as the peppermint. A valuable oil is extracted from the peppermint plant which is extremely stimulating.

## The Silkworm

The keeping of Silkworms is an interesting and inexpensive hobby. Should any of my readers feel an inclination to take it up, there are many butterfly farms where a supply could be obtained. Compare the silkworm with the butterfly and moth (see p. 137 for this). First the tiny egg, then the larva, followed by the pupa, and finally the moth again.

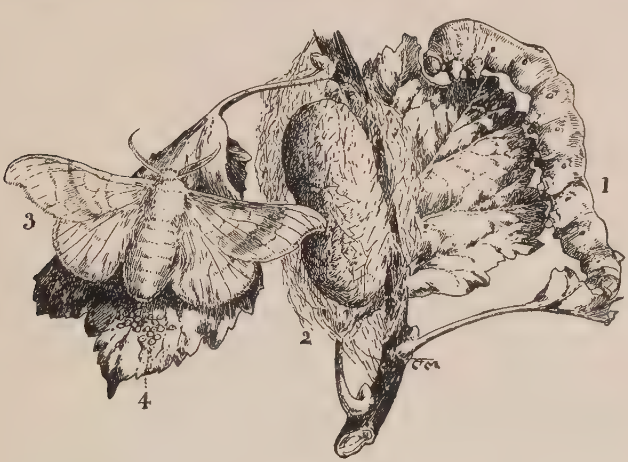
It is estimated that one moth will lay about three hundred eggs. The food-plant of the creature is the mulberry leaf, and unless one has a mulberry tree in his garden it is of little use to try to rear silkworms. There are many hundreds of mulberry trees cultivated in France under Government patronage, for the silk industry is highly important.

There is no need for me to repeat the process of moulting, &c., so clearly shown in the chapter referred to above. The chief interest in the worm centres around the silken cocoon, woven by the larva for its pupal stage, for from these cocoons we obtain the precious silk.

The sticky substance which ultimately hardens into threads of silk, is secreted by two large glands which extend along the greater part of the worm's body and terminate at the mouth.

When the larva is about a month old it starts spinning its cocoon. At first the fibre is rough and coarse, and is used for an outside covering. As the creature gradually winds the silken thread from the outside to the inside (contrast this with the method we adopt in winding a ball of string) the fibre becomes much finer and far more valuable.

When the worm has spun slightly over one thousand feet of fibre it ceases work, having made a cocoon about the size of a pigeon's egg. If left for about two or three weeks the pupa would emerge as a moth, but if this were the case the silk fibre would be so disarranged that it could not be reeled. After a selection of pupæ have been made for purposes of reproduction, the rest are cast into ovens heated by hot air, water, or steam. This at once destroys the worms, and it is estimated that there are three thousand worms destroyed to produce a sovereign's worth of silk.



Silkworm

1, Caterpillar. 2, Cocoon. 3, Moth. 4, Eggs.

The cocoons intended for reproduction are placed in a darkened room, and when the moths emerge, they simply lay their eggs after a few days, and die.

When the moth that was placed in the oven is destroyed, it is removed, and the hard covering of the cocoon, consisting of the coarse, rough fibre, is taken away. The cocoon is then placed in a basin of hot water. This softens the gummy substance on the strands of silk, and loosens the coils which have become matted. To assist this, the water is gently stirred by a few twigs.

The silk is now passed through the glass eye of the reeling machine, and when the cocoon has been fully wound, another thread from a second cocoon is fastened to the end of the first one, and so on. The silk is wound into hanks and tied in bundles of a dozen.

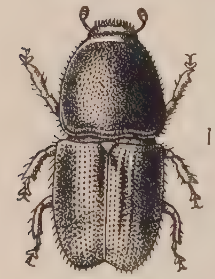
The final stage of manufacture is the weaving of the silk threads into serviceable material from which ribbons, dresses, umbrella covers, handkerchiefs, &c., are made. The chief centre of the silk industry is Lyons, in Southern France.

Over one million pounds of raw, and nearly a million pounds of spun silk are annually used in this country, and silken goods to the value of fourteen million pounds are yearly imported, so it will be seen that the tiny worm is by no means an insignificant creature.

## Beetles

This would not be a bad month in which to study Beetles, for there are numerous specimens to hand. It is extraordinary how little notion the average person has of the numbers of different varieties of beetles. Most people know of perhaps some half-dozen sorts, including the cockroach, the cockchafer, and the burying beetle, but are astonished to be told that there are *between three and four thousand kinds in this country alone.* They are of varying sizes, ranging from the size of a pin's head up to that of a boy's hand.

Many beetles, notably those known as weevils, especially in their grub or larval stage, are very destructive to flowers, leaves, nuts, bark of trees, &c.; but others, such as the lady-bird, are beneficial. Some of the most destructive are the **Bark Beetles**, which attack both forest and fruit trees. Their eggs may be found just under the bark. They are laid here so that the young may feed on the rich sapwood when they are hatched. (I hardly need point out how



Bark Beetle
(Line shows nat. size)

destructive this is to the young trees.) A hole is bored right through the outer bark of the tree, and the eggs are laid along a gallery from ½ in. to 4 in. long. The larvæ when hatched gnaw out tunnels at right angles to the parent gallery. We do not suffer from this beetle's depredations nearly as much as the great forests in North America.

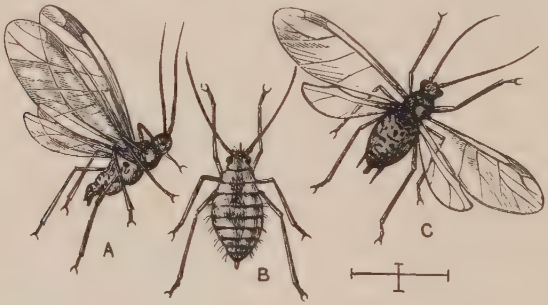
The **Burying Beetle** is certainly one of the most interesting and useful of the family. If you wish to procure a few specimens, and are keen enough naturalists not to mind rather offensive work, you should bait a place with a piece of rotting meat. If the meat be in an exposed position under the direct rays of the sun, before many days have passed the burying beetles will have arrived. The female would have burrowed her way into the putrid flesh and laid her eggs. While she was thus snugly hidden, many other beetles would have been undermining the meat, by throwing back the earth with their strong jaws and sharp proboscces. In time a circular mound would be made, and when the meat had sunk with its own weight, the beetles would scoop the mould over it from the surrounding mound. You may know this beetle by its striking red bands on the abdomen. It is truly wonderful what a long distance these "sextons" are able to scent their prey. Another interesting beetle is the **Rove** or **Cocktail**. It is so called because of the habit of raising its tail. Many people call it "The Devil's Coach-horse". The cocktails are very useful in devouring insects which are harmful to vegetation.

Other most interesting members of the beetle tribe are the Tigers, Stags, Blaps, and the iridescent Glowworms and Fireflies—which last two sorts are beetles notwithstanding their names. Of course, it may not be possible for the reader to obtain specimens of, for instance, the firefly, but the glowworm is by no means uncommon in certain parts of the country. It is only the female of the latter class which gives out the light, for the purpose of attracting the male, which flies about in the twilight. Even when these luminous beetles are beheaded, they still have the power to give out this shining green or orange light from their lower extremities.

## Enemies of the Gardener

What a large number of insect grubs there are to be found on nearly all kinds of plant life! Perhaps these foes of the gardener may be better studied in May and June, for, after the frost, rain, and thunder, there are at least six distinct insect plagues.

By far the most destructive are the Aphides, which hatch in late spring. It is estimated that if there were no enemies to kill them off, they would increase at such an enormous rate that in three months there would be no room left for any other live creature in the world. Thousands of these pests are killed by the gardener with a solution largely consisting of soft soap, which is squirted over the foliage of the plants they attack. Their greatest enemy, though, is the **Ladybird**. This pretty little beetle is the gardener's best friend, for her grubs spend nearly all their time in killing aphides and plant lice. It is said that a plague was once averted through the introduction of the ladybird.



Currant Aphis

A, Male. B, Apterous female. C, Winged female.

On p. 156 we have seen how the Ant has her special aphis which she attends to, and milks; but though she rears large numbers of them, and keeps them in their special places on grass at the side of the anthill, yet she herself does a great deal of harm. She sometimes burrows on the grass of lawns, and I have counted as many as forty small ant-hills thrown up from the turf after a shower of rain. Among the more important types of insect pests well worthy of study are the Saw-fly, the Rose Aphis, and the Hop Grub.

## The Seashore

Though it may seem over-ambitious to include anything in the way of a study of the seashore in a book of the limited dimensions of the present volume, it also would seem a pity not to refer at all to some of its wonders, in a chapter associated with August, from a nature-lover's point of view.

August is, with us in these islands, the great holiday month, when in enormous numbers the dwellers in town betake themselves to the coast. There the reader who is seeking to be able to read the book of nature will not be content to devote all his time to seaside amusement of the artificial kind. He will be attracted to the less frequented stretches of the shore as the explorer is drawn by the lure of unmapped lands. Shells alone offer a most interesting study.

Tennyson could see the artistic beauty of the delicate whorls of the shells, as he clearly shows us in his poem, "The Shell", how beautifully they are constructed:

> See what a lovely shell,
> Small and pure as a pearl,
> Lying close to my foot,
> Frail, but a work divine,
> Made so fairily well
> With delicate spire and whorl,
> How exquisitely minute,
> A miracle of design!

My object will be to make a simple classification of shells sufficient for a general outline of their structure, and the broad classes to which they belong. If the subject were gone into deeply there is matter enough for extended study;

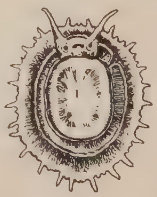
but we cannot afford the time for more than a cursory glance.

We have already studied the formation of the shells of snails and slugs (see pp. 93 and 94). Shells of the seaside animals are made in a very similar way. Their chemical composition is invariably a mixture of carbonate of lime and a small proportion of organic matter, both of which are secreted from glands in the mantle of the mollusc. A true shell grows with the animal it encloses. The bony coverings of crabs and other crustaceans are not shells in the scientific sense. This so-called shell is rightly named a **test**. It does not grow with the creature's body, but is cast and renewed from time to time.

Each separate and distinct part of a shell is called a **valve**. When the shell consists of only one piece or valve, as the Tower Shell, Whelk, &c., it is called a **univalve**; when there are two separate parts, as in the Common Tellens or Mussels, they are known as **bivalves**; and in a few particular cases, where the shell is composed of eight pieces, as in the Chiton family, it is called a **multivalve**.

The **Limpet** is one of the best known of the univalves. It can easily be captured—that is, if you are able to detach it from the rocks—and it makes a good subject for the marine aquarium. Rarely do you walk along the coast at low tide without seeing a limpet. Stranded by the tide on the rocks, they lie quite still with their conical shells glued to the face of the rock. They are most difficult to dislodge. Their great tenacity lies in their power to create a vacuum. (Try to realize, by reference to the leathern sucker

Limpets on Rock



Under side of Limpet

experiment, what is meant by creating a vacuum, and how the downward pressure of air on the surface of the sucker is not counterbalanced by any upward pressure.) Sometimes these lazy creatures lie on the rocks so long that they hollow out grooves with their feet.

The **Periwinkle** is also well known. It has a spiral shell, and rather an ungainly one. Scotch people eat this mollusc in large quantities under the name of the **Buckie.**

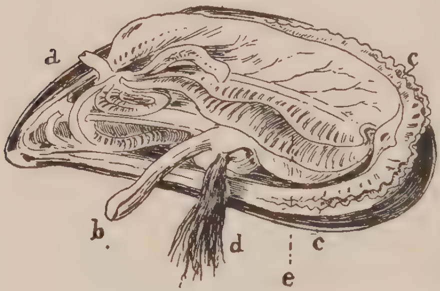
**Whelks** are probably the most common of univalves. They may be called the "tyrants of the seashore", as they often attack smaller shellfish, and extract the bodies of their prey by boring holes through the shells. Woe be to the periwinkle if he is out sunning himself when a whelk crosses his path! Amongst the English, the whelks form an important article of food.

Oyster

The best known of the bivalves are the **Oyster** and **Mussel.** The former is produced from spawn, which is laid on the flats of Brightlingsea, Whitstable, and other Eastern districts. (You have heard of the annual "Oyster Feast" at Colchester.)

**Oysters** are to be found on the mud flats rather than on sandy shores. Should they drift on to the latter, a grain of sand will probably get between the hinges of their shells, so that they will be unable to close them, and thus they would probably be smothered. (Remember the Pearl Oyster of the Indian and Pacific Oceans, which belongs to quite a different family from the Common Oyster found in British seas.) In the Gravesend and Essex districts oyster beds are laid down, and the food given the molluscs causes them to make very thin shells, and to have a delicious flavour. These home-bred oysters are called "natives".

**Mussels** may be found firmly joined to breakwaters or rocks by a kind of silken thread. Sometimes they entirely cover the surface of the rock. They are extensively eaten, but many fatal cases of mussel poisoning have occurred. There appears to be no special method of determining the poisonous varieties, and every time we eat them we run a certain risk, as mussel experts themselves cannot tell the cause of the poison, nor when it is present.



Mussel Shell (single), showing mussel

*a*, Mouth. *b*, Foot. *c c*, Mantle. *d*, Byssus.
*e*, Gills.

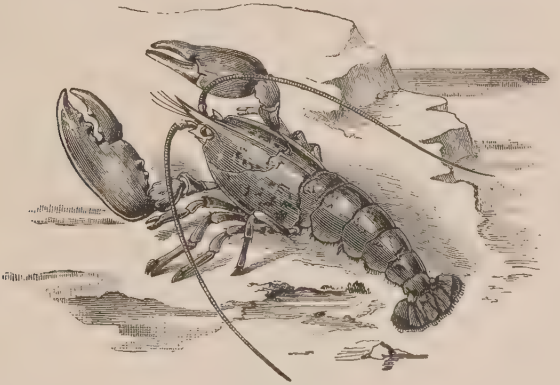
The reader will have no difficulty in making quite a large collection of sea-shells, but may find it very much harder to name them. There are, however, many well-illustrated books devoted to shells alone, with the aid of which, identification should not be a serious problem.

Give yourself time to appreciate the lovely construction of these beautiful dwellings.

> The tiny cell forlorn,
> Void of the little living will
> That made it stir on the shore;
> Did he stand at the diamond door
> Of his house in a rainbow frill?
> Did he push, when he was uncurl'd,
> A golden foot or a fairy horn
> Thro' his dim water-world?

# Crustaceans

The most common and popular examples of these are: Crabs, Lobsters, Prawns, and Shrimps. Most of them may be found under stones, or hidden in the crevices of rocks. Many of them, too, are splendid scavengers. All of them (named above) have five pairs of feet, and for this reason they are frequently called **Decapoda**, that is, ten-footed animals. When they grow too large for their shells they retire to a safe retreat, and "moult", as it were. During this time they take very little food. They remain in their hiding-places until their new coats—which have really pushed the old ones off—are hard enough to protect their bodies.



Lobster

As there are plenty of people who have never seen any lobster but a boiled one, it is perhaps not unnecessary to refer to the fact that the living lobster is not red but very nearly black.

Lobsters are terrible warriors, and there is constant warfare between them. Should two meet, there is invariably a fight, and frequently four or five limbs are left behind. In time new ones grow, and with their full complement they once again go forth to war.

Should any of my readers visit the Natural History Museum at South Kensington, they will see a remarkable model of crabs at the various stages of shell-casting. There are about a dozen crabs arranged one above another, and gradually increasing in size. The stages are plainly dated, and the model is highly instructive.

*Nature Study for the Month:*

1. The Harvest Field.
2. Wheat.
3. Medicinal Plants.
4. The Silkworm.
5. The Beetle Family.
6. The Seashore.
7. Shells.
8. Crustaceans.

*Flowers of the Month:* Self-heal, Rue, Purple Loosestrife, Samphire, Stork's Bill, Sow Thistle, Corn Cockle, Tansy, Wormwood, Harebell, Wild Mignonette, Arrowhead, Cinquefoil, Mountain Poppy, Milkwort, Small Knapweed, Hemp-nettle, and Woody Nightshade.

# APPENDIX I

## How to Construct an Aquarium

The chief things we must bear in mind are cheapness and simplicity. An aquarium built by oneself is far more interesting than the most expensive and elaborate one bought ready-made.

A few shillings will provide a large glass cover similar to those used by the confectioner to put over cakes, &c. A wooden stand, with a hole in the centre into which the knob of the jar can be fitted, will not be difficult to make. The glass cover, inverted, and with its knob fixed into the hole, will make a perfectly satisfactory miniature aquarium.

The jar must be three parts filled with *pond* water. (The secret of success in the management of the aquarium is to make everything as *natural* as possible. In the pond water there will be innumerable eggs and tiny insects on which the fish, tadpoles, &c., feed, which will not be found in hard water.) It would be better to cover the bottom of the jar with pond mud before pouring in the water, and to prevent the mud being washed on one side it would be wise to pour the water on a large stone placed in the jar. Water-weeds may then be planted in the mud, both those with roots, and others, like the duck-weed, which float on the water, being necessary. Finally, place a few pebbles along one side of the jar. Some fish are naturally shy and like to hide themselves. Needless to say, these pebbles must come from the pond too.

It would be advisable to fasten some wire gauze across the top of the jar, or some of the more active creatures will climb out, especially the amphibians. Over the sides of the jar a sheet of paper should be pasted. The fish only get light from above, therefore the darkened sides will make their surroundings more natural. Before using the aquarium it would be wise to let it stand for two or three weeks, so that the water-weeds will take root, and the spawn, &c., on their roots develop.

A second aquarium should be made if amphibians are to be kept. This can be constructed in a similar way, except that a ledge must be provided above water, so that the Newts, Frogs, &c., may crawl out of the water and rest on the ledge.

Discretion must be exercised in stocking the aquarium. On no account should Sticklebacks be placed in the same jar as the gentle

Minnows, as the former are terrible fighters. Indeed "tiddlers" may be kept in a separate jar, when, if there be male and female, you may see them making their nest. Water-scorpions, and the large Yellow-backed Beetles ought, also, to have a jar to themselves, and the same remark applies to the Crayfish.

Suitable creatures to live together are the Tadpole, Caddis Worm Water-spider, Water-mussel, Pond Snails, and Minnow. If you place a few small beads in the jar, it is quite possible that you may see the Caddis Worm construct its case with them.

Many people err in thinking that they must change the water daily. Much more important is it to change the water-weeds, for these contain the natural food of the fish, &c. The water need not be changed under a month if the weeds are attended to. Directly a dead fish is seen, remove it at once, as one dead fish does more to contaminate the water than twenty live ones.

Do not feed the fish with bread crumbs. A little ground rice is preferable. A few "gentles", or ant's eggs, are acceptable, but if a good supply of weeds be maintained the fish should thrive without any other food.

When you change the water, siphon it off by the aid of a long rubber tube.

# APPENDIX II

## How to Skeletonize Leaves

It often happens that we wish to refer to some particular leaf in studying Plant Life, with regard to the comparisons and contrasts in shape, size, &c. It is therefore advisable to skeletonize some of the most common leaves, and mount them on a sheet of cartridge paper with a thin solution of gum.

One of the simplest methods by which I have obtained very serviceable skeletons is as follows: Place a piece of soap about the size of a walnut in half a saucepanful of water. Put the leaf on the water, and let it simmer for about forty minutes. (Do not let the water boil or it will wash the leaf into shreds.) Take the leaf from the saucepan, and with a soft brush—made of camel's hair or any similar material—gently brush off the skin from both sides. When this has been done the leaf should be pressed between the leaves of a book, so that it will not warp before it hardens.

# APPENDIX III

## How to Preserve the Colour of Leaves

A friend once recommended me to adopt the following method in preserving autumn leaf coloration, and since then, as the advertisement runs, "I have used no other".

The leaves of Copper Beeches, Hazels, Chestnuts, and the beautiful tinted leaves of some of the creepers are collected during the autumn. When the collection is complete a tray full of silver sand is put before the fire, or in the oven, for several hours, so that it may become thoroughly dry. The leaves are then placed in the sand so that they are quite covered and do not touch each other. They remain there for two or three weeks in a perfectly dry place—if the sand be kept in a damp corner the experiment will be an utter failure. The leaves are then thoroughly dry and their beautiful tints have "set". They must be gently brushed with a camel's hair brush. They may now be mounted on a sheet of white cardboard with a very thin solution of gum used very sparingly. The stalks should be fixed down with thin strips of paper.

# APPENDIX IV

## How to Prepare Ferneries

The fernery should always be in a shady corner which is generally damp and well drained. Ferns do not do well on a clayey soil which is badly drained. A bed of cinders may form the foundation, and garden soil may be heaped upon it. Rocks, pieces of bark, flints, burrs, &c., should be arranged in any order—by all means do not make the arrangement geometrical; we have only to look at some of the geometrically arranged gardens, paths, &c., of some of our parks to see the ill effect of destroying Nature's handiwork.

The ferns may be obtained from the woodlands. The best time to remove them is late autumn. When they are planted, the soil must be pressed very firmly round their roots, which are well spread out, and the whole fernery covered with three or four sacks of autumn leaves, which will act both as a protection from the winter cold and as a rich manure.

# APPENDIX V

## How to Grow Bulbs

When we first endeavoured to grow Hyacinths, Daffodils, &c., we found that the stems and leaves of the bulbs developed far more rapidly than the roots. In time the tips of the leaves turned yellow and died off before the flower was developed. A friend suggested that this could be avoided if the bulb *were kept in the dark for the first month.* We followed this advice, and while the roots grew at a rapid pace, so as to almost fill the jar, the stems were correspondingly slow of growth. After we had taken them from the dark cupboard and placed them on the table, in the light of day, the leaves quickly shot up and the flower-buds reached maturity in a perfectly healthy manner. In the first case the roots were not developed fast enough to support the growth of the foliage, but by keeping the latter backward this was avoided. November is the best month in which to place the bulbs on the jars, and they should be in full bloom towards the end of January.

### HOW TO GROW BULBS IN FIBRE

A better plan than growing bulbs on jars filled with water is to develop them on fibre. In the former case the bulb itself often comes into direct contact with the water, and therefore rots.

The fibre should be sprinkled over the bottom of a bowl, tin, or some similar object, to the depth of about 2 inches. The bulbs should be carefully placed on this so that they do not touch one another. Now fill up the tins with fibre and cover the tops of the bulbs. Care must be taken not to pack the fibre too tightly.

The bulbs may be "started" by thoroughly soaking the fibre with water, draining it off, and *then keeping the fibre moist.* The bowl should be placed in an airy room in some dark corner for the first fortnight. Directly the young rootlets pierce and entwine themselves around the fibre, the tins may be brought into the open near the window, so that the growth of the bulbs may be matured and the flower developed. More satisfactory results are to be obtained by growing on fibre than by any other method we have tried.

PRINTED AND BOUND IN GREAT BRITAIN
*By Blackie & Son, Limited, Glasgow*